



FINAL

12 DECEMBER 2005

REVISION 1

Long-Term Monitoring Plan For OU A, OU NSC, OU B T, PMP, and OU C

Bremerton Naval Complex

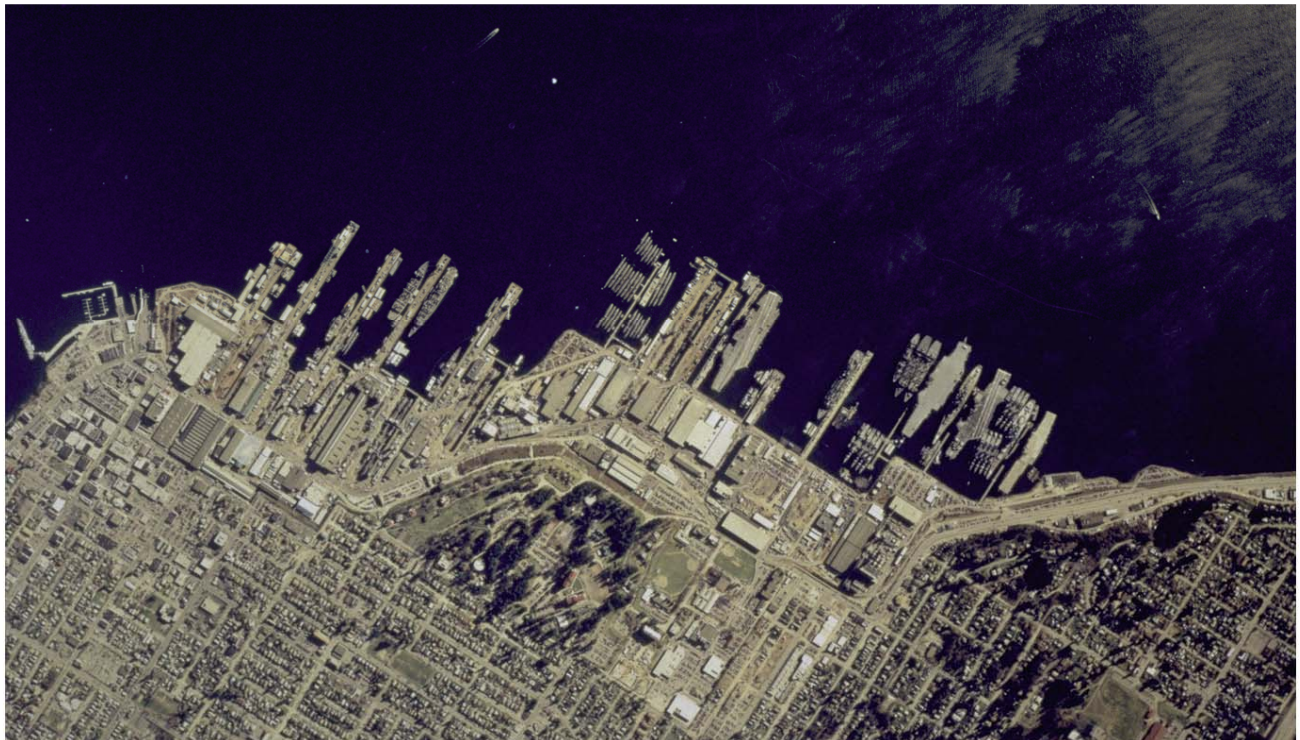
Bremerton, Washington

Department of the Navy

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FINAL
LONG-TERM MONITORING PLAN

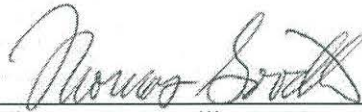
FOR
OU A, OU NSC, OU B T, PMP,
AND OU C

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON

SES-TECH

DECEMBER 12, 2005
REVISION 1

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ACRONYMS AND ABBREVIATIONS

AAO	Accumulation Area Operator
ARAR	applicable or relevant and appropriate requirement
BNC	Bremerton Naval Complex
BTEX	benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFD	Certificate of Disposal
CIA	Controlled Industrial Area
CIH	Certified Industrial Hygienist
DMV	Department of Motor Vehicles
DRMS	Defense Reutilization and Marketing Service
Ecology	Washington State Department of Ecology
Eh	oxidation reduction (“redox”) potential
EHW	extremely hazardous waste
EPA	U.S. Environmental Protection Agency
FCR	Field Change Request
FID	flame ionization detector
FISC	Fleet and Industrial Supply Center
GFCI	ground fault circuit interrupter
GPS	global positioning system
HW	hazardous waste
ID	identification
IDW	investigation-derived waste
IMF	Intermediate Maintenance Facility
IRIMS	Installation Restoration Information Management System
KO	Contracting Officer
LNAPL	light non-aqueous phase liquid
LTM/O	long-term monitoring/operations

ACRONYMS AND ABBREVIATIONS (continued)

µg/L	micrograms per liter
MTCA	Model Toxics Control Act
NA	not applicable
NAPL	non-aqueous phase liquid
NAVFAC NW	Naval Facilities Engineering Command Northwest
Navy	U.S. Navy
NTR	Navy Technical Representative
NWTPH-Dx	Northwest total petroleum hydrocarbons—diesel fraction
NWTPH-Gx	Northwest total petroleum hydrocarbons—gasoline fraction
OU B T	Operable Unit B Terrestrial
OU NSC	Operable Unit Naval Supply Center
OU	Operable Unit
PCB	polychlorinated biphenyl
PID	photoionization detector
PMP	Petroleum Management Plan
PPE	personal protective equipment
PQCM	Project Quality Control Manager
PSNS	Puget Sound Naval Shipyard
PVC	polyvinyl chloride
QC	quality control
RI/FS	remedial investigation/feasibility study
RIP	Remedies in Place
ROD	Record of Decision
RPM	Remedial Project Manager
SAA	Satellite Accumulation Area
SAP	Sampling and Analysis Plan
SES-TECH	Sealaska Environmental Services-Tetra Tech EC, Inc. Joint Venture
SHSS	Site Health and Safety Specialist

ACRONYMS AND ABBREVIATIONS (continued)

SOP	Standard Operating Procedure
SWTS	solid waste tracking sheet
TCE	trichloroethene
TDMS	Technical Data Management System
TOM	Task Order Manager
TPH	total petroleum hydrocarbons
TSDF	treatment, storage, and disposal facility
TSS	total suspended solids
VOC	volatile organic compound
WAC	Washington Administrative Code
WAD	Waste Area Designation
WQC	Water Quality Criteria
WSW	Washington State Dangerous Waste Label

1. INTRODUCTION

1.1 PURPOSE AND SCOPE

This Long-Term Monitoring/Operations (LTM/O) Plan is being generated for the use of the Sealaska Environmental Services-Tetra Tech EC, Inc. (SES-TECH) joint venture under Contract Number N44255-05-D-5101 for the Bremerton Naval Complex (BNC). BNC includes Naval Base Kitsap at Bremerton, the Puget Sound Naval Shipyard (PSNS), Intermediate Maintenance Facility (IMF), and associated tenants. BNC is located along the shoreline of Sinclair Inlet in Bremerton, Washington (Figure 1-1). The LTM/O includes the following sites at BNC: Operable Unit (OU) A, OU Naval Supply Center (OU NSC), OU B Terrestrial (OU B T), the Petroleum Management Plan (PMP) well locations, and OU C. Remedial activities at OU D are complete and land has been transferred to the City of Bremerton. This plan consolidates all pertinent data from existing approved documents completed by other Navy contractors. A brief site background and history for the OUs and BNC are presented in Section 2 and a more detailed history of prior investigations can be found in previous documents. This document is being prepared as an all-in-one resource for the field sampling and inspection activities required under the OU Records of Decision (RODs) and other monitoring documents. Data summary reports are provided following monitoring events, and data evaluation and trend analysis will be provided separately.

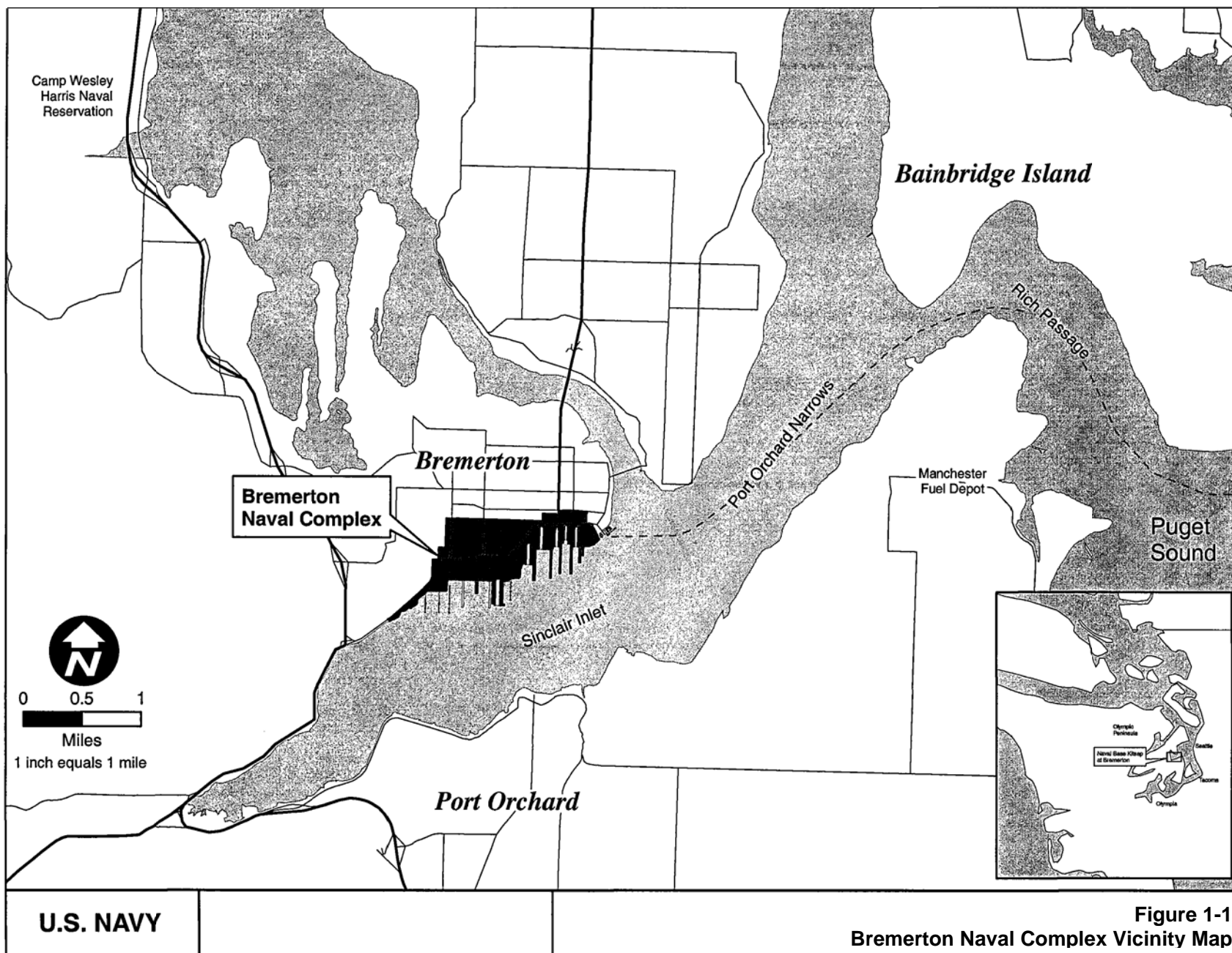
Activities addressed by this plan include LTM/O sampling and analysis, well installation and development in support of monitoring, as well as remediation remedy inspection. These activities will be administered under Task Order 1, with all health and safety evaluations and controls being addressed in the Site Health and Safety Plan (SES-TECH 2005a) and the LTM/O Contract Accident Prevention Plan (SES-TECH 2005b). Data quality objectives and other quality control requirements are included in the Quality Control Plan (SES-TECH 2005c) prepared for this task. Addenda to the Site Health and Safety Plan and Quality Control Plan are provided as Appendices A and B, respectively.

The purpose of monitoring activities at these sites is to assess and ensure compliance with the design for remedial action and with applicable or relevant and appropriate requirements (ARARs), as described in the final RODs for each OU.

1.2 REFERENCE DOCUMENTS

The following referenced documents were previously approved and then used to create this combined Long-Term Monitoring Plan:

1. Final Monitoring Plan, Operable Unit A, The Environmental Company, Inc., February 2003 (The Environmental Company 2003a).
2. Final Monitoring Plan for Operable Unit NSC, The Environmental Company, Inc., February 2003 (The Environmental Company 2003b).
3. Final Long-Term Monitoring Plan, Operable Unit B Terrestrial, URS Group, Inc., July 2, 2004 (URS Group, Inc. 2004).
4. 2003 Amended Petroleum Management Plan, URS Group, Inc., December 2003 (URS Group, Inc. 2003).
5. Final Site Work Plan, Groundwater Monitoring, Operable Unit C, The Environmental Company, Inc., August 2004 (The Environmental Company 2004).



T:\PNS\ynapa\Bremerton Naval Complex Vicinity Map.mxd

2. LONG-TERM MONITORING

The following sections include the overall sampling summary for the OUs. The data and monitoring requirements from each OU are outlined in each applicable ROD, as well as in the long-term monitoring plans generated for each OU and summarized in subsequent sections below. A brief description of each OU is included below.

The long-term monitoring at BNC includes the collection of groundwater data including water and petroleum product levels, field parameters, and groundwater contaminant levels. Table 2-1 presents the OUs and analytical methods required for each. Specific requirements such as field parameters and well analytical requirements are included in subsequent sections. Table 2-2 depicts the BNC sampling schedule for this task.

Limitations in sampling gear due to the varying depths to groundwater in each area require that some wells be sampled using surface-mounted peristaltic pumps, while others require downhole electric pumps. The sample pump requirements for each well are included in the respective tables for each OU.

2.1 OPERABLE UNIT A

OU A is located at the southwestern end of the BNC (Figure 2-1). The site was created through placement of fill material beginning in the 1940s and now covers an area of approximately 12 acres. OU A formerly included 27 acres of intertidal and subtidal areas adjacent to the filled areas. The marine portion of OU A was incorporated into OU B Marine to address chemical levels in the marine environment. Sinclair Inlet (to the south) and State Route 304 (to the north) border OU A. LTM monitoring at OU A has been conducted semi-annually since summer 1999.

2.2 OPERABLE UNIT NSC

OU NSC is a paved, industrial facility covering an upland area of approximately 28 acres, and includes all of the Fleet and Industrial Supply Center (FISC, formerly known as Naval Supply Center) (Figure 2-1). OU NSC is bordered by Sinclair Inlet to the south, "T" street to the east, "Z" street to the west, and Rogers Avenue to the north.

The land occupied by OU NSC was created between approximately 1900 and 1950 by placement of miscellaneous fill materials. The ground surface in OU NSC is flat and almost entirely paved or covered by buildings. FISC consists of large, relatively old buildings and former supply pier C. FISC has a role as the primary materials supplier to the BNC, and the

buildings on-site are primarily warehouses and offices for staff involved in supply functions.

A quay wall reaching an estimated depth of 40 feet below the ground surface extends along the full length of the waterfront at OU NSC. The quay wall was apparently installed in stages for erosion control, when swampy and intertidal areas were filled to create additional land for the naval complex.

LTM monitoring at OU NSC has been conducted semi-annually since summer 1999.

2.3 OPERABLE UNIT B TERRESTRIAL

OU B originally included both terrestrial and marine areas of the BNC. It was separated into marine and terrestrial units in 1999. OU B T consists of approximately 60 to 65 acres of upland area containing a number of industrial facilities (including various shops and warehouses), dry-docks, cranes, and rail lines (Figure 2-1). OU B Marine consists of approximately 230 acres of intertidal and subtidal marine areas extending along the shore of the BNC. Approximately 27 acres of intertidal and subtidal areas of OU B Marine are adjacent to the fill that comprises OU A.

Most of the OU B T site is paved and access is restricted. OU B T consists primarily of the Controlled Industrial Area (CIA) of the PSNS portion of the BNC.

The LTM monitoring at OU B T began in winter 2005.

2.4 PETROLEUM MANAGEMENT PLAN

Based on the requirements of the existing OU RODs, the PMP applies to management of petroleum hydrocarbon contamination at OU A, OU NSC, and OU B T. OU C and OU D are currently excluded from the requirements of this plan. OU C is excluded from the PMP because it is not a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) site, while OU D has been removed from BNC operable units because remedial activities have been completed and the site was turned over to the City of Bremerton. The PMP is intended to provide a summary of current complex-wide environmental conditions and petroleum hydrocarbon monitoring requirements. Moreover, it provides a framework to guide and sequence future investigation and remediation activities.

The PMP is focused only on the occurrence and management of petroleum hydrocarbon contamination. It does not address other potential contaminants of concern.

The LTM monitoring for the PMP is in its second year of activities. To date, two semi-annual events have been completed.

2.5 OPERABLE UNIT C

OU C is located in the north-central portion of PSNS, in the upland portion of BNC north of Decatur Avenue and northwest of Coghlan Road (Figure 2-1). The area is topographically higher than much of the BNC operations area, with elevations ranging from approximately 60 feet to 100 feet above mean sea level. The site is centered on a steep ravine, which was flattened by fill materials placed on original surface prior to tank construction. The area south of OU C is about 50 to 60 feet lower in elevation and consists of the CIA for PSNS.

OU C includes former Tanks 315 and 317. The primary source of petroleum contamination at OU C is considered to be Tank 317, a 5-million-gallon tank constructed of concrete in 1919 that was used mainly for storing No. 6 fuel oil (Bunker C). More than 80,000 gallons of petroleum product were estimated to be floating on the unconfined groundwater table beneath and immediately downgradient of former Tank 317. After remediation efforts to remove the petroleum, it is estimated that approximately 50,000 gallons of the fuel remain. Although the floating product is primarily Bunker C fuel oil, diesel and gasoline components have also been detected.

LTM monitoring at OU C began in 2000.

Table 2-1. BNC Analytical Parameters

Location	Frequency	TSS 160.2	NWTPH- Gx	NWTPH -Dx	TCE 8260B	Pesticides 8081A Low Level	BTEX 8021B	Dissolved Metals 6020	Total Mercury 7470	Total Metals 6020
OU A	Semi-Annual									X
OU B T	Quarterly				X	X		X	X	
OU C	Quarterly	X	X	X						
OU NSC	Semi-Annual	X								X
Background	Semi-Annual	X	X	X						X
PMP	Semi-Annual	X	X	X			X			

Clarifications regarding total number of sample analyses and target analytes are as follows:

OU A – The target analytes for total metals include arsenic, copper, lead, nickel, and zinc.

OU B T – The target analytes for pesticides include 4,4'-DDE, 4,4'-DDT, aldrin, dieldrin, and heptachlor epoxide. The target analytes for total metals includes mercury, while target analytes for dissolved metals include arsenic, copper, lead, nickel, and zinc. If free-petroleum-related product is present in a well, a product or product/water sample will be collected for analysis of total polychlorinated biphenyl (PCB) Aroclors by U.S. Environmental Protection Agency (EPA) Method 8082. If PCBs are not detected, PCB analysis will be discontinued.

OU C – Samples will be analyzed quarterly for 3 quarters during the period of performance (October 2005, January 2006, April 2006).

OU NSC – The target analytes for total metals include arsenic, copper, lead, and nickel.

Background – Monitoring will be conducted at well 346 coincident with OU NSC monitoring.

Notes: TSS = Total Suspended Solids

NWTPH-Gx = Washington State Department of Ecology (Ecology) Northwest Method for Total Petroleum Hydrocarbons as Gasoline

NWTPH-Dx = Ecology Northwest Method for Total Petroleum Hydrocarbons as Diesel and Heavy Oil

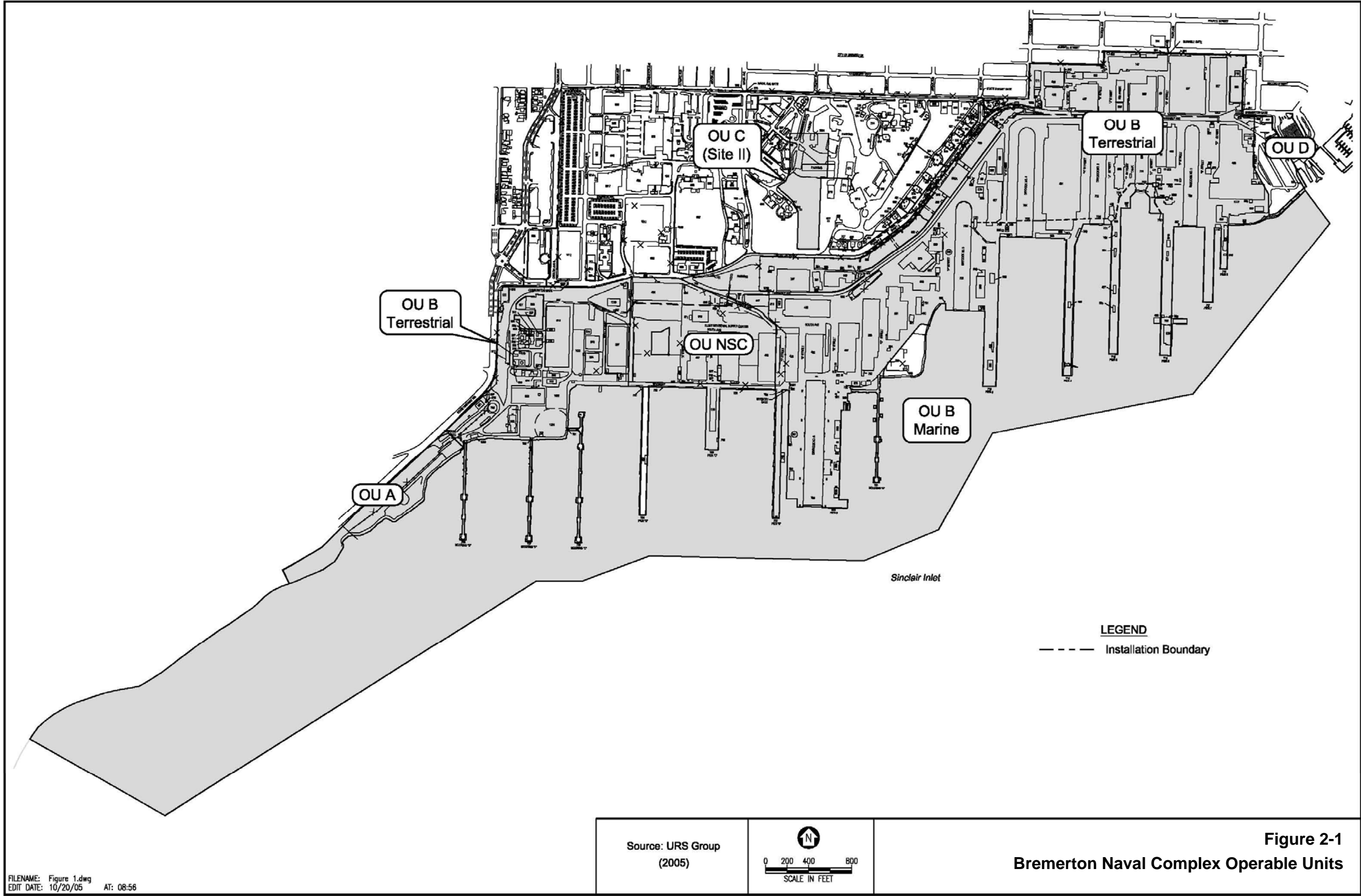
TCE = Trichloroethene by EPA Method 8260B

PCB = Polychlorinated Biphenyl by EPA Method 8082

BTEX = Benzene, Toluene, Ethylbenzene, and Xylenes by EPA Method 8021B

Table 2-2. BNC Analytical Schedule

Sampling Event	Date
OU B T Summer 2005	July-2005
OU A/NSC Summer 2005	August-2005
OU B T Fall 2005	October-2005
OU B T PMP Fall 2005	October-2005
OU C Fall 2005	October-2005
OU B T Winter 2005	January-2006
OU C Winter 2005	January-2006
OU A/NSC Winter 2005	January-2006
OU B T Spring 2006	April-2006
OU B T PMP Spring 2006	April-2006
OU C Spring 2006	April-2006



3. OPERABLE UNIT A

3.1 FIELD SAMPLING REQUIREMENTS

During groundwater monitoring activities, field parameters will be collected from the monitoring wells in this OU. Table 3-1 identifies the various field parameters that will be collected prior to sample collection. After water level and light non-aqueous phase liquid (LNAPL) measurements are taken, the well will be purged using low-flow sampling techniques. More information on field sampling is included in the Field Procedures (Appendix C). OU A wells that will be monitored are shown on Figure 3-1. The background well 346 is part of the OU A sampling program to evaluate potential off-site contamination sources. This well location is shown on Figure 2-1.

Groundwater sampling activities at OU A will be scheduled based on consideration of tide cycles due to the proximity and influence from Sinclair Inlet. Tide cycles affecting Sinclair Inlet levels potentially influence groundwater quality, with the potential for increased brackishness greatest at high tide (The Environmental Company 2003a). To reduce the potential influence of tides, groundwater-sampling activities will be scheduled to coincide with low tides to the extent practicable and within daylight hours on weekdays. An attempt will be made to collect groundwater samples for laboratory analysis within a 4- to 5-hour window bracketing the selected low tide.

Table 3-1. Summary of Groundwater Monitoring Field Measurements

Field Parameters									
Well Identification	pH	Temperature	Conductivity	Salinity	Turbidity	Dissolved Oxygen	Eh ^{1/}	Water Levels	LNAPL ^{2/}
203	✓	✓	✓	✓	✓	✓	✓	✓	✓
204	✓	✓	✓	✓	✓	✓	✓	✓	
206	✓	✓	✓	✓	✓	✓	✓	✓	✓
208	✓	✓	✓	✓	✓	✓	✓	✓	✓
241	✓	✓	✓	✓	✓	✓	✓	✓	
Background Well 346	✓	✓	✓	✓	✓	✓	✓	✓	

^{1/} Eh = Redox Potential
^{2/} LNAPL = Light non-aqueous phase liquid

3.2 OU A ANALYTICAL REQUIREMENTS

Table 3-2 lists analytes for OU A groundwater samples and Table 3-3 summarizes environmental and field quality control samples.

Table 3-2. Summary of OU A Groundwater Sample Analysis and Sample Collection Methods

Well Identification	Laboratory Analysis	
	Total Metals ^{1/}	Sample Collection Method
203	✓	Peristaltic Pump
204	✓	Peristaltic Pump
206	✓	Peristaltic Pump
208	NA	Peristaltic Pump
241	✓	Peristaltic Pump
Background Well 346	✓	Electric Submersible Pump

^{1/} Total metals by EPA Method 6020
NA = Not applicable

Table 3-3. Summary of OU A Environmental and Field Quality Control Samples by Analysis

Laboratory Analysis	Environmental Samples	Field Quality Control Samples		
		Field Duplicate	Trip Blank	Matrix Spike/Matrix Spike Duplicate
Total Metals ^{1/}	5	1	NA	1

^{1/} Total metals by EPA Method 6020
NA = Not applicable

3.3 OU A CLEANUP LEVELS

Cleanup levels for OU A have been implemented based on the ROD for the site. A summary of the OU A cleanup levels is shown in Table 3-4.

3.4 SAMPLING LOCATION AND FREQUENCY

Semi-annual (February and August) groundwater monitoring activities at OU A will be conducted at seven well locations. Six of the monitoring well locations (203, 204, 206, 208,

241, and 266) are shown on Figure 3-1. The seventh well, background well 346, is shown on Figure 2-1.

Table 3-4. Groundwater Cleanup Levels for OU A

Chemical	Basis	Cleanup Level
Arsenic	NTR	0.5
Copper	State WQC	2.5
Lead	State WQC	5.8
Nickel	State WQC	7.9
Zinc	State WQC	76.6

Notes:

Groundwater cleanup levels are based on the protection of adjacent surface waters of Sinclair Inlet.

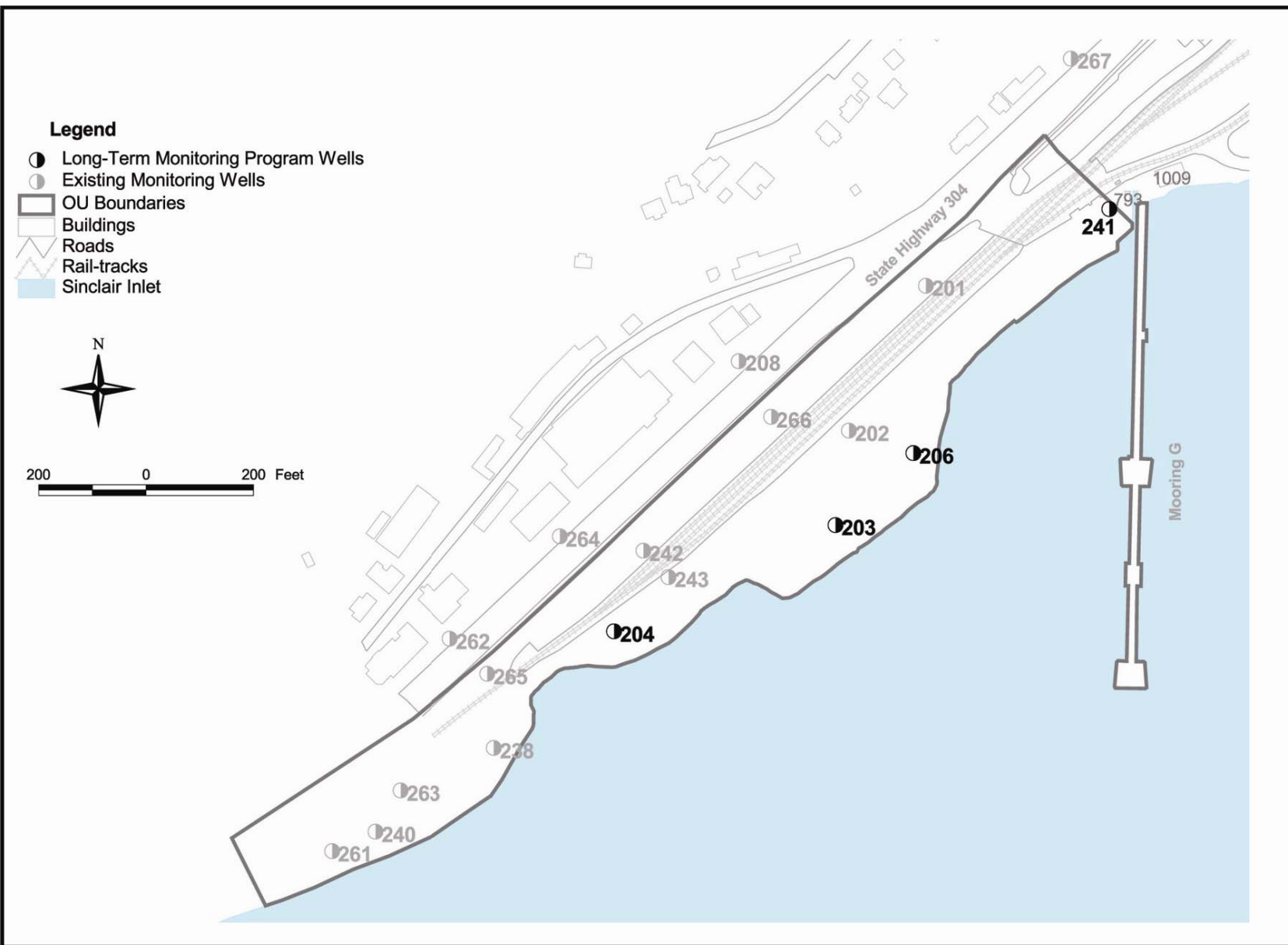
All concentrations in micrograms per liter (µg/L).

NTR – Navy Technical Representative

State WQC – State of Washington Water Quality Criteria

Monitoring well locations were selected based upon the combination of the wells that showed ARAR exceedance during the remedial investigation/feasibility study (RI/FS) sampling and the locations that displayed the highest levels of soil concentrations for the chemicals with specified cleanup goals. Background well 346 was selected to evaluate ambient groundwater conditions. Monitoring well 208, located north of OU A, was used to evaluate a known off-site (upgradient) source of petroleum contamination.

Monitoring wells 203 and 206 are located in the central portion of the Missouri parking lot area at OU A (refer to Figure 3-1). The Navy has previously coned off these locations the night prior to sampling to ensure that cars do not park over these sample station locations. Coordination with the project-specified NTR is required to ensure these locations are properly coned off prior to each planned sampling effort. Field measurements to be collected at the time of sampling, including pH, temperature, conductivity, salinity, turbidity, dissolved oxygen, redox potential, depth to groundwater, and LNAPL measurement are summarized by well in Table 3-1.



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Figure 3-1
 OU A Well Location Map

4. OU NSC

4.1 FIELD SAMPLING REQUIREMENTS

During groundwater monitoring activities, field parameters will be collected from the monitoring wells in this OU. Table 4-1 identifies the field parameters that will be collected prior to sample collection. After water level and LNAPL measurements are taken, the well will be purged using low-flow sampling techniques. More information on field sampling is included in the Field Procedures (Appendix C). OU NSC wells that will be monitored are shown on Figure 4-1. The background well 346 is part of the OU NSC sampling program to evaluate potential off-site contamination sources. This well location is shown on Figure 2-1.

Groundwater sampling activities at OU NSC will be scheduled based on consideration of tidal cycles due to the proximity and influence from Sinclair Inlet. Tidal cycles affecting Sinclair Inlet levels potentially influence groundwater quality, with the potential for increased brackishness greatest at high tide (The Environmental Company 2003b). To reduce the potential influence of tides, groundwater-sampling activities will be scheduled to coincide with low tides, to the extent practicable, and within daylight hours on weekdays. An attempt will be made to collect groundwater samples for laboratory analysis within a 4- to 5-hour window bracketing the selected low tide.

Table 4-1. Summary of OU NSC Groundwater Monitoring Field Measurements

Well Identification	Field Parameters								
	pH	Temperature	Conductivity	Salinity	Turbidity	Dissolved Oxygen	Eh ^{1/}	Water Levels	LNAPL ^{2/}
310	✓	✓	✓	✓	✓	✓	✓	✓	✓
380	✓	✓	✓	✓	✓	✓	✓	✓	✓
386	✓	✓	✓	✓	✓	✓	✓	✓	✓
392 ^{3/}	✓	✓	✓	✓	✓	✓	✓	✓	✓
Background Well 346	✓	✓	✓	✓	✓	✓	✓	✓	

^{1/} Eh = Redox Potential

^{2/} LNAPL = Light non-aqueous phase liquid

^{3/} Well 392 will be replaced with 392A in winter 2005/2006

4.2 OU NSC ANALYTICAL REQUIREMENTS

Table 4-2 lists analytes for OU NSC groundwater samples and Table 4-3 summarizes environmental and quality control samples.

Table 4-2. Summary of OU NSC Groundwater Sample Analysis and Sample Collection Method

Well Identification	Laboratory Analysis				Sample Collection Method
	Total Metals ^{1/}	Total Petroleum Hydrocarbon		TSS ^{4/}	
		Gasoline-Range TPH ^{2/}	Diesel-Range TPH ^{3/}		
310	✓			✓	Electric Submersible Pump
380	✓			✓	Peristaltic Pump
386	✓			✓	Peristaltic Pump
392 ^{5/}	✓			✓	Peristaltic Pump
Background Well 346	✓	✓	✓	✓	Electric Submersible Pump

^{1/} Total metals by EPA Method 6020

^{2/} Gasoline-range total petroleum hydrocarbons (TPH) by Ecology Method NWTPH-Gx

^{3/} Diesel-range TPH by Ecology Method NWTPH-Dx (Extended)

^{4/} TSS by EPA Method 160.2

^{5/} Well 392 will be replaced with 392A in winter 2005/2006.

Table 4-3. Summary of OU NSC Environmental and Field Quality Control Samples by Analysis

Laboratory Analysis	Environmental Samples	Field Quality Control Samples		
		Field Duplicate	Trip Blank	Matrix Spike/Matrix Spike Duplicate
Total Metals ^{1/}	5	1	NA	1
Gasoline-Range TPH ^{2/}	1	0	1	1
Diesel-Range TPH ^{3/}	1	0	NA	1
TSS ^{4/}	5	1	NA	NA

^{1/} Total metals by EPA Method 6020
^{2/} Gasoline-range TPH by Ecology Method NWTPH-Gx
^{3/} Diesel-range TPH by Ecology Method NWTPH-Dx (Extended)
^{4/} TSS by EPA Method 160.2
NA = Not applicable

4.3 OU NSC CLEANUP LEVELS

The formation of the cleanup levels for OU NSC is included in the ROD for the site. A summary of the cleanup levels is shown in Table 4-4.

Table 4-4. Groundwater Cleanup Levels for OU NSC

Chemical	Basis	Cleanup Level (µg/L)
Arsenic	NTR	0.5
Copper	State WQC	2.5
Lead	State WQC	5.8
Nickel	State WQC	7.9
Total Petroleum Hydrocarbons	MTCA A	1,000
NTR – Navy Technical Representative		
State WQC – State of Washington Water Quality Criteria		
MTCA A – Washington State Department of Ecology Model Toxics Control Act - Method A		

4.4 SAMPLING LOCATION AND FREQUENCY

Semi-annual (February and August) groundwater monitoring activities at OU NSC will be conducted at five well locations. Monitoring well locations (310, 380, 386, and 392) are shown on Figure 4-1. One background location (well 346) is also sampled to assess ambient groundwater conditions. This well is shown on Figure 2-1.

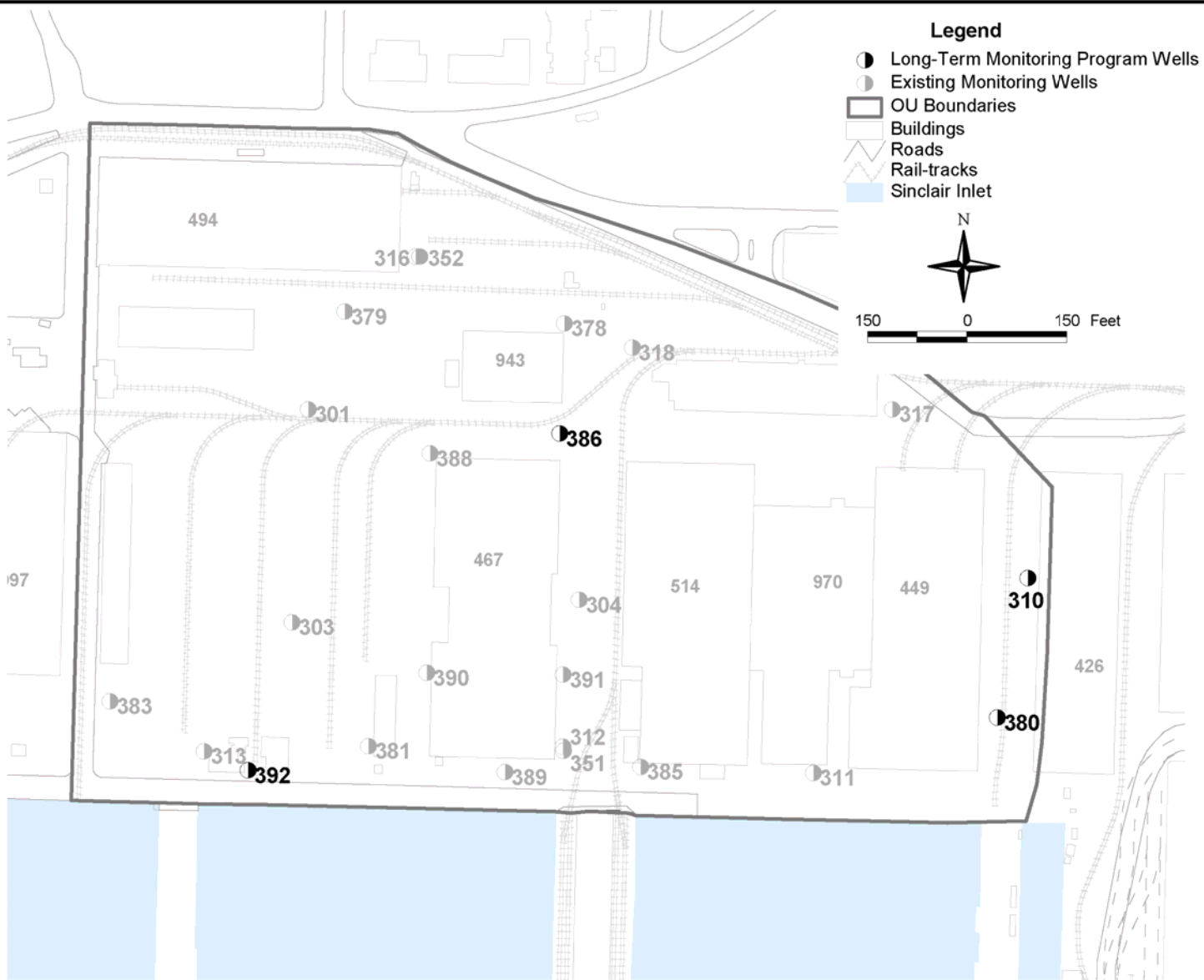


Figure 4-1
OU NSC Well Location Map

SES-TECH

5. OU B TERRESTRIAL

5.1 FIELD SAMPLING REQUIREMENTS

During groundwater monitoring activities, field parameters will be collected from the monitoring wells in this OU. Table 5-1 identifies the field parameters that will be collected prior to well sample collection. To support reporting, field parameters for Sinclair Inlet also will be determined from a surface water grab sample collected once per each sampling event. After water level and LNAPL measurements are taken, the well will be purged using low-flow sampling techniques. More information on field sampling is included in the Field Procedures (Appendix C). OU B T wells that will be monitored are shown on Figure 5-1.

Quarterly groundwater sampling activities at OU B T will be scheduled based on consideration of tidal cycles due to the proximity and influence from Sinclair Inlet. Tidal cycles affecting Sinclair Inlet levels potentially influence groundwater quality, with the potential for increased brackishness greatest at high tide (URS Group, Inc. 2004). To reduce the potential influence of tides, groundwater sampling activities will be scheduled to coincide with low tides, to the extent practicable, and within daylight hours on weekdays. An attempt will be made to collect groundwater samples for laboratory analysis within a 4- to 5-hour window bracketing the selected low tide.

Table 5-1. Summary of OU B T Groundwater Monitoring Field Measurements

Well Identification	Field Parameters						Water	
	pH	Temperature	Conductivity	Salinity	Turbidity	Dissolved Oxygen	Eh ^{1/}	Levels LNAPL ^{2/}
410	✓	✓	✓	✓	✓	✓	✓	✓
432	✓	✓	✓	✓	✓	✓	✓	✓
433	✓	✓	✓	✓	✓	✓	✓	✓
704	✓	✓	✓	✓	✓	✓	✓	✓
707	✓	✓	✓	✓	✓	✓	✓	✓
LTMP-1	✓	✓	✓	✓	✓	✓	✓	✓
LTMP-2	✓	✓	✓	✓	✓	✓	✓	✓
LTMP-3	✓	✓	✓	✓	✓	✓	✓	✓
LTMP-4	✓	✓	✓	✓	✓	✓	✓	✓
LTMP-5	✓	✓	✓	✓	✓	✓	✓	✓
Sinclair Inlet Surface Water	✓	✓	✓	✓	✓	✓	✓	

^{1/} Eh = Redox Potential
^{2/} LNAPL = Light non-aqueous phase liquid

5.2 OU B T ANALYTICAL REQUIREMENTS

Table 5-2 lists analytes for OU B T groundwater samples and Table 5-3 summarizes environmental and field quality control samples.

Table 5-2. Summary of OU B T Groundwater Sample Analysis and Sample Collection Method

Well Identification	Laboratory Analysis				Sample Collection Method
	TCE ^{1/}	Pesticides	PCBs ^{2/}	Total Mercury and Dissolved Metals	
410	✓	✓	✓	✓	Electric Submersible Pump
432	✓	✓	✓	✓	Electric Submersible Pump
433	✓	✓	✓	✓	Peristaltic Pump
704	✓	✓	✓	✓	Peristaltic Pump
707	✓	✓	✓	✓	Electric Submersible Pump
LTMP-1	✓	✓	✓	✓	Peristaltic Pump
LTMP-2	✓	✓	✓	✓	Peristaltic Pump
LTMP-3	✓	✓	✓	✓	Peristaltic Pump
LTMP-4	✓	✓	✓	✓	Peristaltic Pump
LTMP-5	✓	✓	✓	✓	Peristaltic Pump

^{1/}TCE - trichloroethene

^{2/}PCB - polychlorinated biphenyl. Testing for PCBs will only occur if liquid-phase petroleum is discovered during well monitoring. If petroleum is observed, a sample of the product will be collected and analyzed for PCBs. If no PCBs are present, sampling for PCBs will be discontinued.

Table 5-3. Summary of OU B T Environmental and Field Quality Control Samples by Analysis

Laboratory Analysis	Environmental Samples	Field Quality Control Samples		
		Field Duplicate	Trip Blank	Matrix Spike/Matrix Spike Duplicate
Volatile Organics ^{1/}	10	1	1	1
Pesticides ^{2/}	10	1	NA	1
Total Mercury & Dissolved Metals ^{3/}	10	1	NA	1
PCBs ^{4/}	10	1	NA	1

^{1/} Volatile Organics = TCE by EPA Method 8260B

^{2/} Pesticides by EPA Method 8081A

^{3/} Total mercury by EPA Method 7470; dissolved metals by EPA Method 6020

^{4/} PCBs = PCBs by EPA Method 8082

NA = Not applicable

5.3 O U B T CLEANUP LEVELS

The formation of the cleanup levels for O U B T is included in the ROD for this site. A summary of the cleanup levels is shown below in Table 5-4.

Table 5-4. Soil and Groundwater Cleanup Levels for O U B T

Chemical	Basis	Cleanup Level (µg/L)
Trichloroethene	MTCA B Carcinogen	55.6
4,4'-DDT	MTCA B Carcinogen	0.000356
4,4'-DDE	MTCA B Carcinogen	0.000356
Aldrin	MTCA B Carcinogen	0.0000816
Dieldrin	MTCA B Carcinogen	0.0000867
Heptachlor Epoxide	MTCA B Carcinogen	0.0000636
Arsenic ^{1/}	WA NAT BG	5.0
Copper ^{2/}	WA MW - Chronic	3.1
Lead ^{2/}	WA MW - Chronic	8.1
Mercury ^{3/}	WA MW - Chronic	0.025
Nickel ^{2/}	WA MW - Chronic	8.2
Zinc ^{2/}	WA MW - Chronic	81

^{1/} The arsenic Standard Method B Surface Water Formula Value is 0.0982 µg/L. The Method B value is below the natural background concentration of 5.0 µg/L. The background level of 5.0 µg/L will be used for determining compliance.

^{2/} Criteria for arsenic, copper, lead, nickel, and zinc are based on dissolved analyses.

^{3/} Mercury is based on total recoverable fractions.

Notes:

µg/L – microgram per liter

MTCA B-Carcinogen — MTCA Standard Method B Surface Water Formula Values — Carcinogen (*Cleanup Levels and Risk Calculations under the Model Toxics Control Act Cleanup Regulation, CLARC, Version 3.1*)

WA MW-Chronic — Washington Water Quality Standards—Marine Water, Protection of Aquatic Life—Chronic (WAC 73-201A-040)

WA NAT BG – Washington State natural background for arsenic as cited in Washington Administrative Code (WAC) 173-340-900

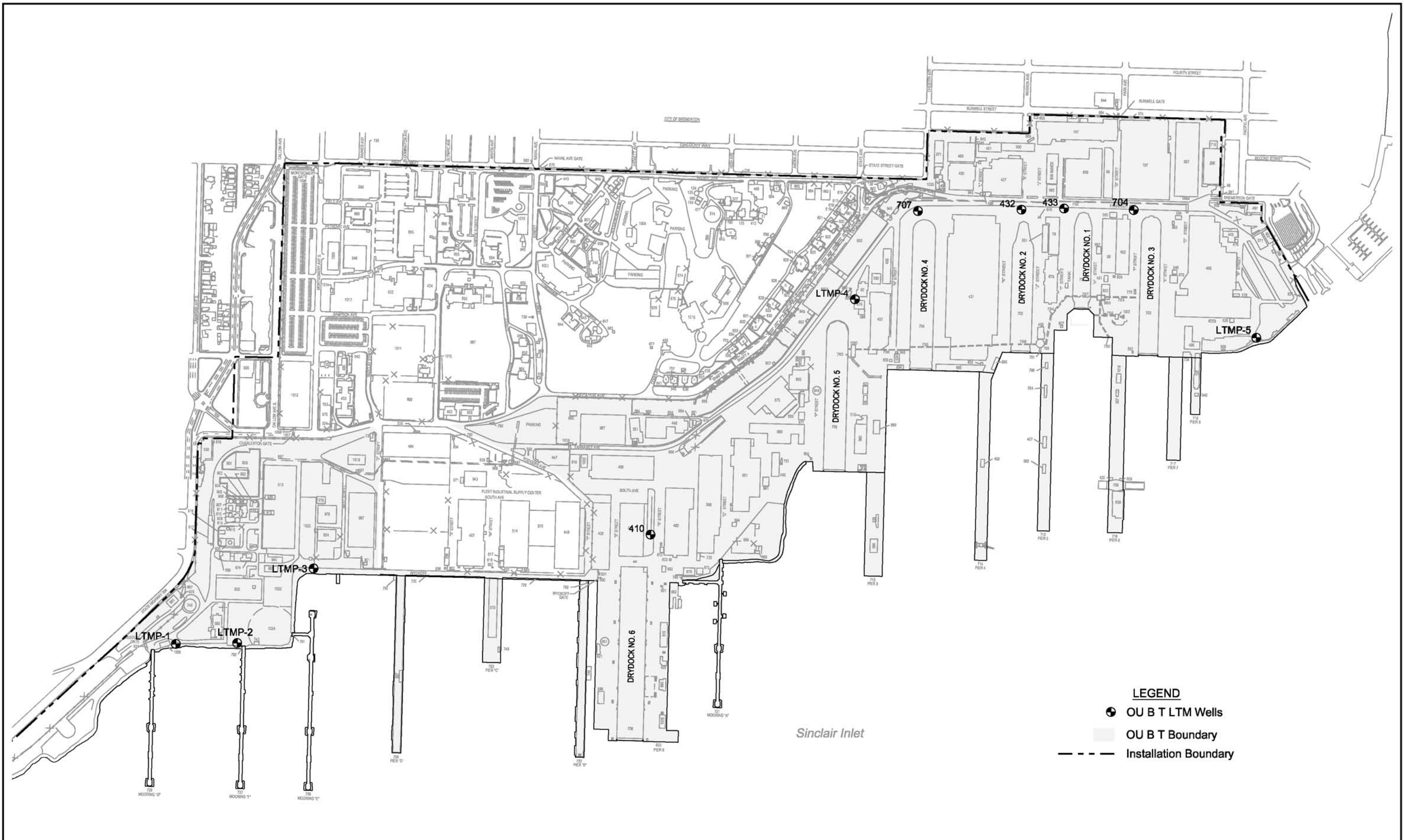


Figure 5-1
OU B T Well Location Map

6. PETROLEUM MANAGEMENT PLAN

6.1 FIELD SAMPLING REQUIREMENTS

During groundwater monitoring activities, field parameters will be collected from the monitoring wells in this OU. Table 6-1 identifies the field parameters that will be collected prior to sample collection. After water level and LNAPL measurements are taken, the well will be purged using low-flow sampling techniques. More information on field sampling is included in the Field Procedures (Appendix C). PMP wells that will be monitored are shown on Figure 6-1.

Semi-annual groundwater sampling activities at PMP wells will be scheduled based on consideration of tidal cycles due to the proximity and influence from Sinclair Inlet. Tidal cycles affecting Sinclair Inlet levels potentially influence groundwater quality, with the potential for increased brackishness greatest at high tide (URS Group, Inc. 2003). To reduce the potential influence of tides, groundwater sampling activities will be scheduled to coincide with low tides, to the extent practicable, and within daylight hours on weekdays. An attempt will be made to collect groundwater samples for laboratory analysis within a 4- to 5-hour window bracketing the selected low tide.

Table 6-1. Summary of Groundwater Monitoring Field Measurements

Well Identification	Field Parameters						Dissolved Oxygen	Eh ^{1/}	Water Levels	LNAPL ^{2/}
	pH	Temperature	Conductivity	Salinity	Turbidity					
382	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
392 ^{3/}	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
406	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
412	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
425 ^{4/}	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
428 ^{4/}	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
704	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
709	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
713	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
715 ^{3/}	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
718	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PMP-1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
LTMP-1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
LTMP-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
LTMP-3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
LTMP-5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

^{1/} Eh = Redox Potential

^{2/} LNAPL = Light non-aqueous phase liquid

^{3/} Wells 392 and 715 will be replaced with 392A and 715A in winter 2005/2006

^{4/} Wells 425 and 428 will be re-developed in winter 2005/2006

6.2 PMP ANALYTICAL REQUIREMENTS

Table 6-2 lists analytes for PMP groundwater samples and Table 6-3 summarizes environmental and field quality control samples.

Table 6-2. Summary of PMP Groundwater Sample Analysis and Sample Collection Method

Well Identification	Laboratory Analysis				Sample Collection Method
	Total Petroleum Hydrocarbon				
	BTEX ^{1/}	Gasoline-Range TPH ^{2/}	Diesel-Range TPH ^{3/}	TSS ^{4/}	
382	✓	✓	✓	✓	Electric Submersible Pump
392 ^{5/}	✓	✓	✓	✓	Peristaltic Pump
406	✓	✓	✓	✓	Peristaltic Pump
412	✓	✓	✓	✓	Peristaltic Pump
425 ^{6/}	✓	✓	✓	✓	Electric Submersible Pump
428 ^{4/, 6/}	✓	✓	✓	✓	Electric Submersible Pump
704	✓	✓	✓	✓	Peristaltic Pump
709	✓	✓	✓	✓	Peristaltic Pump
713	✓	✓	✓	✓	Peristaltic Pump
715 ^{5/}	✓	✓	✓	✓	Peristaltic Pump
718	✓	✓	✓	✓	Electric Submersible Pump
PMP-1	✓	✓	✓	✓	Peristaltic Pump
LTMP-1	✓	✓	✓	✓	Peristaltic Pump
LTMP-2	✓	✓	✓	✓	Peristaltic Pump
LTMP-3	✓	✓	✓	✓	Peristaltic Pump
LTMP-5	✓	✓	✓	✓	Peristaltic Pump

^{1/} Benzene, Toluene, Ethylbenzene, and Xylenes by EPA Method 8021

^{2/} Gasoline-range TPH by Ecology Method NWTPH-Gx

^{3/} Diesel-range TPH by Ecology Method NWTPH-Dx (Extended)

^{4/} TSS by EPA Method 160.2

^{5/} Wells 392 and 715 will be replaced with 392A and 715A in winter 2005/2006

^{6/} Wells 425 and 428 will be re-developed in winter 2005/2006

Notes: PCB analysis by EPA Method 8082 may be performed on any free product identified in the wells. Should analysis not detect PCBs, then no subsequent analysis will be performed. Analysis of product for well 406 showed no PCBs present (URS Group 2005).

Table 6-3. Summary of PMP Environmental and Field Quality Control Samples by Analysis

Laboratory Analysis	Environmental Samples	Field Quality Control Samples		
		Field Duplicate	Trip Blank	Matrix Spike/Matrix Spike Duplicate
BTEX ^{1/}	16	1	1	1
Gasoline-Range TPH ^{2/}	16	1	1	1
Diesel-Range TPH ^{3/}	16	1	NA	1
TSS ^{4/}	16	1	NA	NA

^{1/} BTEX by EPA Method 8021
^{2/} Gasoline-range TPH by Ecology Method NWTPH-Gx
^{3/} Diesel-range TPH by Ecology Method NWTPH-Dx (Extended)
^{4/} TSS by EPA Method 160.2
NA = Not applicable

6.3 PMP CLEANUP CRITERIA

Cleanup criteria are summarized in Table 6-4 below.

Table 6-4. Summary of PMP Cleanup Criteria

Chemical	Basis	Cleanup Level
Gasoline-Range TPH ^{1/}	MTCA A	800/1,000
Diesel-Range TPH	MTCA A	500
Benzene	MTCA A	5
Toluene	MTCA A	1,000
Ethylbenzene	MTCA A	700
Xylenes	MTCA A	1,000

Notes:

All concentrations in micrograms per liter (µg/L)

^{1/} Regulatory and cleanup levels for TPH as gasoline is 1,000 µg/L if no detectable benzene and 800 µg/L if benzene is detected.



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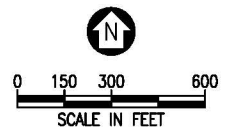


Figure 6-1
PMP Well Location Map

7. OPERABLE UNIT C

7.1 FIELD SAMPLING REQUIREMENTS

During groundwater monitoring activities, field parameters will be collected from the monitoring wells in this OU. Table 7-1 identifies the field parameters that will be collected prior to sample collection. After water level and LNAPL measurements are taken, the well will be purged using low-flow sampling techniques. More information on field sampling is included in the Field Procedures (Appendix C). OU C wells that will be monitored are shown on Figure 7-1.

Table 7-1. Summary of OU C Groundwater Monitoring Field Measurements

Well Identification	Field Parameters						Dissolved Oxygen	Eh ^{1/}	Water Levels	LNAPL ^{2/}
	pH	Temperature	Conductivity	Salinity	Turbidity					
GMWT-9	✓	✓	✓	✓	✓	✓	✓	✓	✓	
GMWT-22	✓	✓	✓	✓	✓	✓	✓	✓	✓	
GMWT-23	✓	✓	✓	✓	✓	✓	✓	✓	✓	
GMWT-24	✓	✓	✓	✓	✓	✓	✓	✓	✓	
GMWT-25	✓	✓	✓	✓	✓	✓	✓	✓	✓	
GMW-4										✓
GMW-5										✓
GMWT-2										✓
GMWT-7										✓
GMWT-10										✓
GMWT-14										✓
GMWT-15										✓
GMWT-16										✓
GMWT-17										✓
GMWT-18										✓
GMWT-19										✓
GMWT-20										✓
PS11-MW05										✓
GMW-26										✓
GMW-27										✓
GMW-28										✓

^{1/} Eh = Redox Potential
^{2/} LNAPL = Light non-aqueous phase liquid

7.2 OU C ANALYTICAL REQUIREMENTS

Table 7-2 lists analytes for OU C groundwater samples and Table 7-3 summarizes environmental and field quality control samples.

Table 7-2. Summary of OU C Groundwater Sample Analysis and Sample Collection Method

Well Identification	Laboratory Analysis			Sample Collection Method
	Total Petroleum Hydrocarbon		TSS ^{3/}	
	Gasoline-Range TPH ^{1/}	Diesel-Range TPH ^{2/}		
GMWT-9	✓	✓	✓	Electric Submersible Pump
GMWT-22	✓	✓	✓	Electric Submersible Pump
GMWT-23	✓	✓	✓	Electric Submersible Pump
GMWT-24	✓	✓	✓	Electric Submersible Pump
GMWT-25	✓	✓	✓	Electric Submersible Pump
^{1/} Gasoline-range TPH by Ecology Method NWTPH-Gx				
^{2/} Diesel-range TPH by Ecology Method NWTPH-Dx (Extended)				
^{3/} TSS by EPA Method 160.2				

Table 7-3. Summary of OU C Environmental and Field Quality Control Samples by Analysis

Laboratory Analysis	Environmental Samples	Field Quality Control Samples		
		Field Duplicate	Trip Blank	Matrix Spike/Matrix Spike Duplicate
Gasoline-Range TPH ^{1/}	5	1	1	1
Diesel-Range TPH ^{2/}	5	1	NA	1
TSS ^{3/}	5	1	NA	NA

^{1/} Gasoline-range TPH by Ecology Method NWTPH-Gx
^{2/} Diesel-range TPH by Ecology Method NWTPH-Dx (Extended)
^{3/} TSS by EPA Method 160.2
NA = Not applicable

7.3 OU C CLEANUP CRITERIA

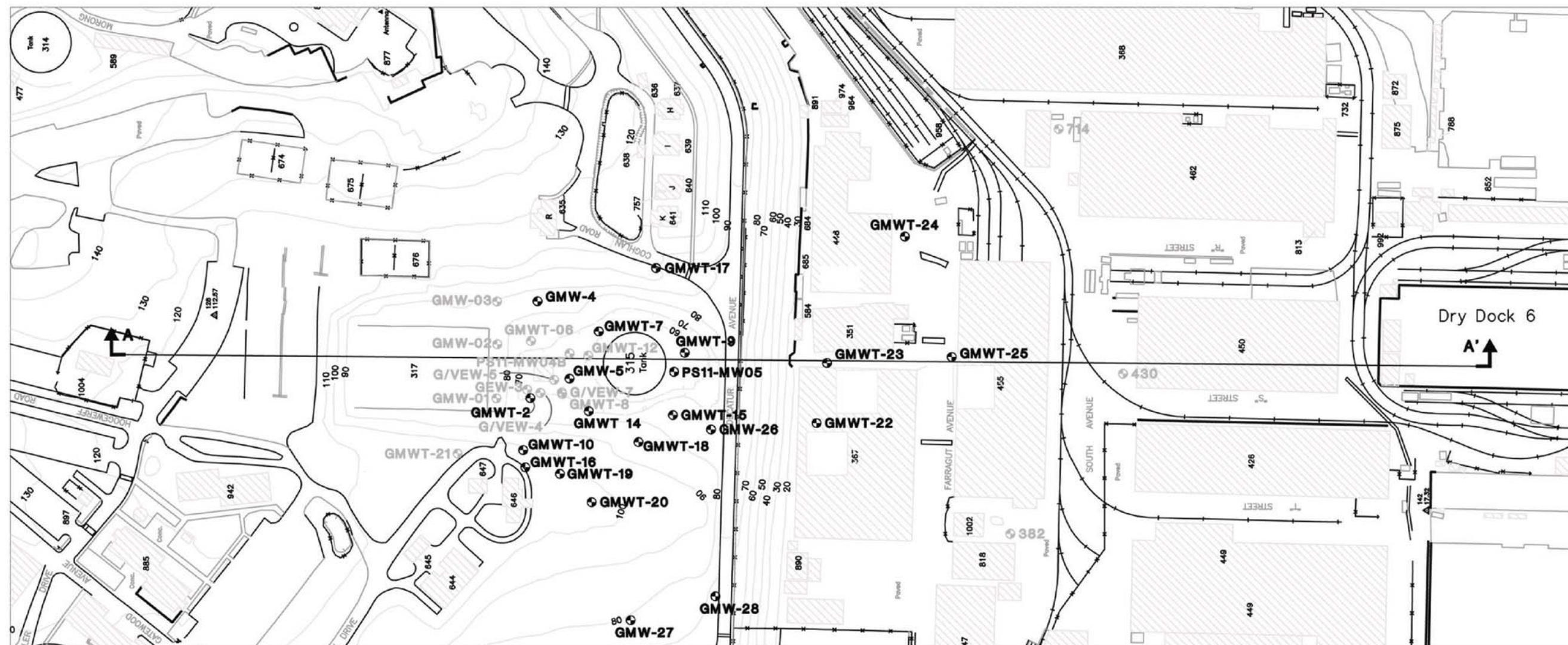
Table 7-4 provides groundwater cleanup criteria for OU C.


Table 7-4. Groundwater Cleanup Levels for OU C

Chemical	Basis	Trigger Level ^{1/} (µg/L)
Gasoline-Range Organics	Ecology	1,000
Diesel- and Oil Range-Organics	Ecology	500


^{1/} Trigger Level based on levels in RI/FS as agreed to by Ecology.

If liquid-phase petroleum is identified in any of the trigger wells, the Navy Remedial Project Manager (RPM) must be notified immediately.

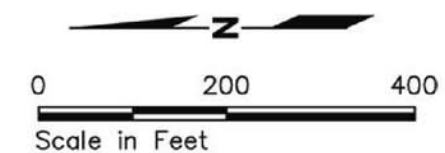


 **GMWT-22** Existing Monitoring Well used for this monitoring program
 Location and Number

 **GMWT-1** Other Existing Monitoring Wells
 (Not Sampled During this Period)

 **AA'** Geologic Cross-Section Transect
 (Refer to Figure 11 for Cross-Section)

Note:
 Base map prepared from electronic files provided by Puget Sound Naval Shipyard
 entitled "Topographic Mapping".



TEC LTM Team
CTO-083

Figure 7-1
OU C Well Location Map

8. WELL INSTALLATION, DEVELOPMENT, AND DECOMMISSIONING

The Winter 2005 PMP monitoring report (URS Group, Inc. 2005) identified that wells 392 and 715 could not be located and were presumed abandoned or destroyed. Under this task, SES-TECH will install two replacement wells in accordance with the requirements of WAC 173-160 for well construction. The previous well locations, if found and not properly decommissioned, will be decommissioned (abandoned) according to WAC 173-160. In addition, wells 425 and 428 have approximately 4 feet and 1.25 feet of sediment at the bottom, respectively, and have been recommended for re-development (URS Group, Inc. 2005).

8.1 GENERAL APPROACH

Wells will be installed to match the depths and screen intervals recorded on well installation diagrams for 392 and 715, with surfaces completed as flush-mount monuments. The replacement wells will be designated 392A and 715A to indicate the new generation in future reporting. Logs for wells are included in Appendix E.

The well installation procedure for both locations will employ a vacuum truck system by the drilling subcontractor to advance the first 5 to 8 feet below ground surface to avoid striking underground utilities with the drill bit. Hollow-stem auger techniques will then be used to advance the borehole and install the new wells. A surge block and bailer or pump will be used for all development and redevelopment activities.

The well installation will produce approximately eight drums of soil cuttings (both from the vacuum truck and drill rig operations). Also, eight drums of well development and decontamination water will be generated. Because the monitoring wells to be installed are replacement wells, no soil sampling is required during the well installation because the site soils have been previously characterized. Wells will be surveyed in accordance with the Standard Operating Procedure (SOP), Installation Restoration Information Management System (IRIMS), and Technical Data Management System (TDMS) for Navy storage of technical data. With the exception of the TDMS submittal and weekly field reports, no additional reports documenting the field activities will be submitted.

A utility locate is required prior to submittal of the outage request/dig permit. Personnel will utilize a handheld global positioning system (GPS) unit to pinpoint the existing well locations based on TDMS coordinates. The utility locator will assist with the attempt to

locate these wells. The utility locator will also provide the utility mark-outs for the location of the new wells.

8.2 MOBILIZATION

Mobilization activities will consist of the following:

- Procure equipment, material, and specialized subcontracts/services;
- Submit access badge requests for site crew and vehicles, if not already badged;
- Participate in a preconstruction meeting and Coordination and Mutual Understanding Meeting with the NTR;
- Perform a utility locate;
- Submit and receive, as necessary, approved excavation permit and road outage area requests for well installation, development, and surveying;
- Conduct indoctrination and training for site personnel; and
- Identify a staging area.

8.2.1 Access Badges and Vehicle Passes

All site employees will be required to obtain a security badge authorizing access to Naval Base Kitsap at Bremerton. Project vehicles must also display a pass permitting entrance into Naval Base Kitsap at Bremerton. Site personnel will complete badge requests in advance and will be issued the appropriate security badges and vehicle passes, as necessary, for entrance to the site. All requests for badges/passes will be coordinated through the NTR. Controlled industrial area access will not be required. It will be the responsibility of the Field Operations Lead to ensure that the NTR has sufficient time to process all badges/pass requests before work commences.

8.2.2 Preparatory Phase Quality Check Meeting

A preparatory phase QC meeting will be held by SES-TECH prior to beginning field activities. The NTR will be notified in advance to allow the NTR the opportunity to attend. SES-TECH will review the plan requirements with the drilling subcontractor during this meeting.

8.2.3 Utility Locate

A utility locate will be performed prior to beginning fieldwork. The utility locate will include a review of existing as-built drawing records (if available), a visual inspection of the area, and a utility locate performed by a locator service. All utilities that are identified will be marked. SES-TECH will discuss with the NTR any utilities that will interfere with or otherwise be interrupted by the work so that appropriate action can be taken. Any utility outage requests will be submitted to the NTR.

8.2.4 Area Outage and Excavation Permit Requests

No later than 15 days prior to the start of fieldwork, the necessary area outage and excavation permit requests will be submitted to the NTR for BNC approval. An excavation permit is required prior to performing the soil borings for well installation.

8.2.5 Indoctrination and Training

As required by the Site Health and Safety Plan (SES-TECH 2005a), the Site Health and Safety Specialist (SHSS) will obtain the medical clearance and training records for all site personnel. Prior to work, all personnel will receive site-specific health and safety and waste management indoctrination, including review the Site Health and Safety Plan and its addendum (Appendix A). This indoctrination will address the construction approach, the chemical and physical hazards associated with the project, emergency procedures, waste management procedures, hazard communication, and the personal conduct expected during the project.

8.2.6 Staging Area

SES-TECH will work with the NTR to locate a staging area suitable for the work to be performed. The staging area will include parking, material and drum storage areas, refuse containers, and sanitary services.

8.3 MONITORING WELL INSTALLATION

Monitoring wells 392A and 715A will be installed according to Ecology's regulations and guidance, notably the *Minimum Standards for Construction and Maintenance of Wells* (WAC 173-160). The exact depth will depend on the estimated (and observed) depth to water at the location, which is chosen in order to stay in the saturated zone throughout the normal annual fluctuation of water levels and, if possible, to provide some screen length above the water table. The wells will be constructed using 2-inch-diameter, flush-threaded,

Schedule 40 PVC blank and factory-slotted 0.010-inch screen, and an end cap. After a vacuum truck has advanced the surface borehole past utility line depths (5 to 8 feet), the borehole will be completed by hollow-stem auger drilling methods with a minimum of 8-inch ID augers, with split-spoon samples for lithographic characterization taken at 5-foot intervals.

The annular space of the well (filter pack) will be filled with clean silica sand (#10-20 unless the site geologist determines a more appropriate size for site soils) from the level of the bottom cap of the well to at least 3 feet above the top of the screen. The sandpack will be settled after placement, either by rodding or by surging of the well. A bentonite seal of at least 2 feet in length will be placed above the top of the sandpack. Bentonite chips or bentonite grout can be used to fill the remaining annular space to within 2 feet of the surface. If a grout is used, the bentonite seal will be hydrated and allowed to set for a minimum of 15 minutes before grouting the remaining annular space with a high-density bentonite grout. The final 2 feet of the annulus will be filled with concrete, into which the monument casing will be set. A flush-mount completion will be used due to the high traffic area.

8.4 MONITORING WELL DEVELOPMENT

The monitoring wells will be developed no sooner than 24 hours after construction to clear the well screen and sandpack of fine materials that reduce communication with the aquifer and increase turbidity. Each well will be developed by a combination of bailing, surging, and pumping, as appropriate. Wells will be developed beginning no sooner than 24 hours after installation to allow bentonite seals and grout to hydrate completely. Each well will be developed by surging with a surge block to move water back and forth through the sandpack. During pumping, the pH, electrical conductance, dissolved oxygen, temperature, and turbidity of the purge water will be monitored. Pumping will continue until the purge water is visibly clear and the pH, specific conductance, dissolved oxygen, temperature, and turbidity have stabilized. The parameters will be considered stable when three consecutive readings of pH, temperature, dissolved oxygen, and conductance do not deviate more than 10 percent and pH not more than 0.5 units. Where possible, the wells will be developed until the water is clear. Data collected during purging will be documented in the field logbook.

8.5 MONITORING WELL SURVEY

A Washington State Professional Land Surveyor will survey the new wells. Well location (x, y) will be measured to an accuracy of ± 0.1 feet, and vertical elevation (z) of both top of casing (measuring point) and ground surface to an accuracy of ± 0.01 feet, both according to appropriate datums consistent with earlier data for the site.

8.6 MONITORING WELL DECOMMISSIONING

Existing monitoring wells 392 and 715 will be decommissioned if located. Wells will be grouted in place because the boring log/well completion diagram is available in both cases. Well casings will be backfilled with an acceptable sealing material, such as neat cement grout or hydrated high solids with 20 percent bentonite slurry. Bentonite chips or pellets will not be used as backfill material. Up to 5 percent of bentonite clay may be added to a cement mixture. The sealing material will be placed with the use of a tremie pipe, proceeding upward from the bottom. Monuments will be removed for disposal and the surface completed with concrete.

9. WASTE MANAGEMENT

Investigation-derived waste (IDW) generated from monitoring activities is expected to consist primarily of personal protective equipment (PPE), monitoring well purge water/decontamination water, and common trash). IDW generated from monitoring well installation will include these materials, as well as soil removed from boreholes.

9.1 LTM SAMPLING WASTE

During the course of the LTM sampling, purge and decontamination water will be generated. If off-site disposal of the IDW liquids is required, SES-TECH will place the IDW water into 55-gallon closed top drums. One drum of IDW will be generated for approximately every four wells sampled. The waste characterization sampling is based on collecting one composite sample from every three drums. The July and August 2005 sampling events will be combined into one disposal sampling event, as will the January and February 2006 sampling events. This results in four waste sampling events. The estimated quantity of IDW and the anticipated number of waste characterization during each sampling event are listed below:

Event 1: Annual Sampling - 60 wells = 15 drums = 5 samples

Event 2: Quarterly Sampling - 15 wells = 4 drums = 2 samples

Event 3: Semi-Annual Sampling - 29 wells = 8 drums = 3 samples

Event 4: Quarterly Sampling - 15 wells = 4 drums = 2 samples

One quality control (QC) sample (duplicate) will be collected during one of the IDW sampling events = 1 sample

Total IDW water characterization samples = 13 samples

PPE and common trash will be disposed of as commercial/municipal waste.

9.2 WELL INSTALLATION AND DEVELOPMENT WASTE

Soil cuttings from well boreholes and water from decontamination and well development will be containerized in drums. An assumed eight drums of soil cuttings from the boreholes and vacuum truck removal will be generated by installation of the two replacement monitoring wells. Because the soil is being generated from two sources, two 3-point

composite samples will be obtained and analyzed for waste profiling and characterization purposes. No QC samples will be collected from the IDW. Table 9-1 identifies the analyses required for soil characterization. Analytes with volatile components, namely BTEX and gasoline-range TPH (NWTPH-Gx), will be collected as a grab using the EPA 5035A method (e.g., an EnCore[®] sampler), with one collected from a drum filled from each borehole.

Table 9-1. Summary of IDW Sample Analysis

Sample Identification	Laboratory Analysis					Total Petroleum Hydrocarbons	
	VOCs ^{1/}	BTEX	Pesticides ^{2/}	Metals ^{3/}	TCLP Metals	Gasoline	Diesel-
						-Range TPH	Range TPH
IDW water	✓		✓	✓		✓	✓
IDW soil		✓			✓	✓	✓

^{1/} VOC - Volatile Organic Compounds by EPA Method 8260B

^{2/} Pesticides by EPA Method 8081A

^{3/} Metals include arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, copper, nickel, and zinc.

Development and decontamination water will be generated during the course of the well installation and redevelopment activities. SES-TECH will place the IDW water into 55-gallon closed-top drums for an estimated total of eight drums. The waste characterization sampling is based on collecting one composite sample from every four drums. Therefore, two water samples will be collected from IDW wastewater. No QC samples will be collected from the IDW. For existing wells that are being redeveloped, monitoring results from the last sampling round will be applied. Table 9-1 identifies the analyses required for water characterization.

All waste storage and disposal activities will be conducted as required by BNC waste procedures. The BNC waste procedures are included as Appendix D. Although no hazardous waste is anticipated to be generated, the BNC procedures for hazardous waste are also included in Appendix D.

10. REPORTING

At the completion of each sampling event, a summary report will be generated and will present the results of the sampling, including a discussion on field methodologies and findings. The data summary report will also include a data validation report and all relevant field notes and deviations from the LTM/O Plan. A discussion on the results of the sampling, as well as recommendations, will also be included in the summary reports. Each summary report will be submitted in draft and final formats with Navy comments on the draft being incorporated into the final report. Well installation, development, and decommissioning information will be included in the summary report immediately following the well installation work.

A Trend Analysis Report will be prepared in fall 2006 to compile data summary reports and provide comparison of analytical results with the ROD required cleanup criteria. The report will discuss trends based on previous sampling data.

11. ANNUAL INSPECTIONS

Annual remedy inspections will be performed at OU A and OU NSC, including the following ROD-specified activities:

- Pavement Inspection
- Fencing Inspection
- Signs Inspection
- Stormwater (Catch Basin) System Inspection

Tables 11-1 through 11-3 provide details on inspection of the paving, fencing, and signs. Records will be requested from the Navy and inspected for instances of unauthorized entry. Restrictions on land use and groundwater use will also be evaluated.

The findings of the annual remedy inspections and associated recommendations will be included in a report. The first annual inspection is planned for summer 2006. Note that an Operations and Maintenance Plan for BNC currently is under preparation and will supersede this when finalized.

Table 11-1. Pavement Inspection and Maintenance Elements for OU A and OU NSC

Element	Trigger for Maintenance	Required Maintenance
Cracks in pavement	Cracks larger than 12 inches in length or depth	Patch and seal cracks
Settling	Localized settlement greater than 12 inches	Patch and seal settled area
Impaired seal coating	Assess the need for resealing	Inspect at least every 5 years

Table 11-2. Fencing Inspection and Maintenance Elements for OU A and OU NSC

Element	Trigger for Maintenance	Required Maintenance
Holes or breaches in fencing	Holes large enough to permit casual access	Repair fencing

Table 11-3. Sign Inspection and Maintenance Elements for OU A and OU NSC

Element	Trigger for Maintenance	Required Maintenance
Sign wording is illegible	Warning cannot be read from a distance of 2 feet	Repaint or replace sign
Sign is vandalized, broken, or missing	Warning has been removed in part or in total	Replace sign

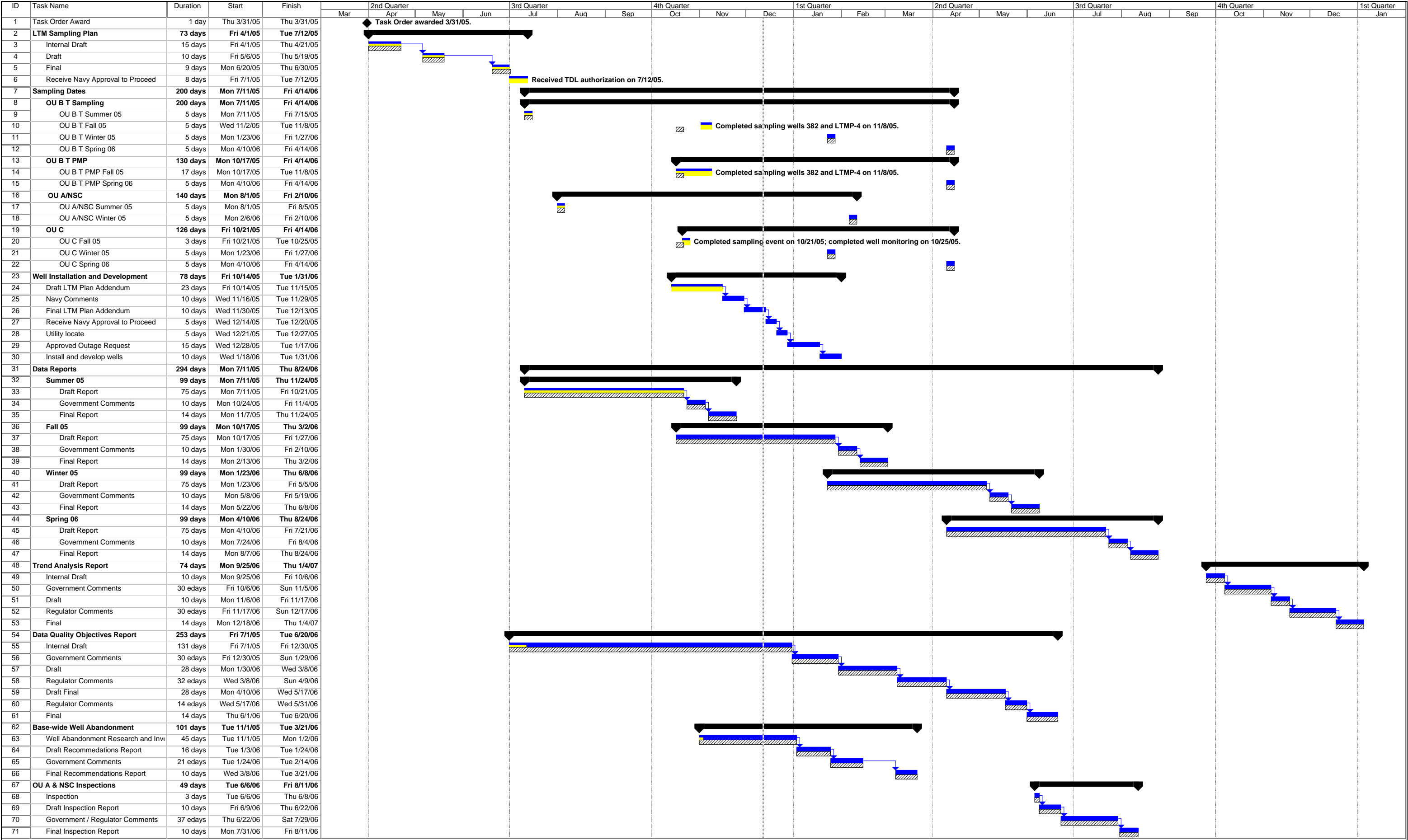
12. PROJECT ORGANIZATION

In accordance with the roles and responsibilities of the professional staff positions as described in Section 5 of the LTM/O Accident Prevention Plan, the following individuals will provide the designated support functions:

- Task Order Manager: Aaron Vernik
- Project Quality Control Manager (PQCM): Greg Joyce
- Field Operations Lead/SHSS: Aaron Vernik
- Alternate SHSS: Leah Vigoren
- Certified Industrial Hygienist (CIH): Philip Bartley
- Program Quality Control Manager: Greg Joyce
- Environmental Compliance Manager: Jennifer Fadden

13. SCHEDULE

A preliminary schedule has been generated for all work associated with this Task Order (see Figure 13-1). At least 2 weeks prior to every sampling event, SES-TECH will prepare and submit a field schedule to Naval Facilities Engineering Command Northwest (NAVFAC NW) as required under this Task Order.



14. REFERENCES

- SES-TECH. 2005a. Site Health and Safety Plan for Log Term Monitoring at OU A, OU NSC, OU B T, PMP, and OU C, Bremerton Naval Complex, Bremerton, Washington. June 30, 2005.
- SES-TECH. 2005b. Final Accident Prevention Plan for Contract N44255-05-D-5101, Department of the Navy, Naval Facilities Engineering Command, Engineering Field Activity, Northwest. June 30, 2005.
- SES-TECH. 2005c. Final Quality Control Plan for Long Term Monitoring at OU A, OU NSC, OU B T, PMP, and OU C, Bremerton Naval Complex, Bremerton, Washington. June 30, 2005.
- The Environmental Company, Inc. 2004. Final Site Work Plan, Groundwater Monitoring, Operable Unit C. August 2004.
- The Environmental Company, Inc. 2003a. Final Monitoring Plan, Operable Unit A. February 2003.
- The Environmental Company, Inc. 2003b. Final Monitoring Plan for Operable Unit NSC. February 2003.
- URS Group, Inc. 2005. Final Winter 2005 Petroleum Management Plan Monitoring Report, Bremerton Naval Complex, Bremerton, Washington. August 17, 2005.
- URS Group, Inc. 2004. Final Long-Term Monitoring Plan, Operable Unit B Terrestrial. July 2, 2004.
- URS Group, Inc. 2003. Amended Petroleum Management Plan. December 2003.

APPENDIX A

ADDENDUM TO FINAL SITE HEALTH AND SAFETY PLAN

CONTRACT NO. N44255-05-D-5101
LTM/O / TASK ORDER 1

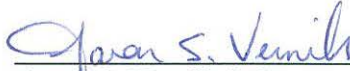
ADDENDUM TO FINAL
SITE HEALTH AND SAFETY PLAN

FOR LONG-TERM MONITORING AT OU A, OU NSC, OU B T, PMP,
AND OU C
BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON

SES-TECH

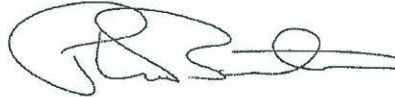
DECEMBER 12, 2005

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1.0 DESCRIPTION OF WORK

The Bremerton Naval Complex (BNC) has six operable units (OUs): OU A, OU B Marine, OU B T, OU C, OU NSC, and OU D. All six operable units will have a Record of Decision (ROD) by July 2005, and all but OU D have Remedies in Place (RIP). Remedial activities at OU D are complete and land has been transferred to the City of Bremerton. In addition, a site-wide Petroleum Management Plan (PMP) has been completed for the BNC. The Long-Term Monitoring (LTM) program for each OU has already begun under separate contracts.

Given the program status and proximity of each OU to each other, it's now the Navy's intent to beneficially consolidate all separate LTM contracting efforts of all terrestrial OUs within the BNC into one contractual effort. No LTM is required for OU D. Each remaining OU has an approved LTM plan, developed with consensus from the regulatory agencies at different times by specific contractors. This LTM Plan is being generated to include the remainder of the OU's LTM requirements including well monitoring, well maintenance, and remedy inspections.

1.1 WELL MONITORING

The scope of this activity includes well monitoring at OU A, OU NSC, OU B T, PMP, and OU C. The well monitoring activities include monitoring for water and/or petroleum product levels, collection of groundwater field parameters during well purging, and the collection of groundwater water samples and subsequent laboratory analysis. The samples will be collected using low flow sampling techniques. All investigation-derived waste (IDW) will be sampled and stored on site pending laboratory analysis and BNC disposal approval. Final data will be delivered to the Navy via summary reports that will be completed after each sampling event.

1.2 WELL INSTALLATION, DEVELOPMENT, DECOMMISSIONING

This activity includes the installation and development of two monitoring wells, development of two other wells, and decommissioning (abandonment) of two wells. Purge water, decontamination water, and soil cuttings will be collected in drums and stored on site pending laboratory analysis and BNC disposal approval.

1.3 REMEDY INSPECTION

OU A and OU NSC currently have in place ROD-specified remedy inspections that occur annually at the sites. These inspections are also part of the LTM Plan and the inspection activities are included in this SHSP. The activities to be completed include: pavement inspection; OU A riprap (seawall) inspection; fencing inspection; and sign inspection. The

inspection will consist of site visits and observation of these remedies. All deficiencies and findings will be included in an inspection summary report.

ATTACHMENT 1

ACTIVITY HAZARD ANALYSIS

Project/Location: TO 1, Bremerton Naval Complex, OU A, OU NSC, OU B T, OU C and PMP		Phase of Work: Well Installation, Development, and Decommissioning
Analysis Performed By: Thomas Goodlin	Date: 11-11-05	Analysis Approved By: Phil Bartley

PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS
Survey site	<p>Slips, trips, and falls from various agents.</p> <p>Failure to properly survey site could cause exposures to electrical hazards and ground hazards.</p>	<ul style="list-style-type: none"> • Work areas will be visually inspected and pre-existing slip, trip, and fall hazards will be marked, barricaded, or eliminated as is feasible. • Work areas will be kept neat and in an orderly state of housekeeping. • Proper illumination will be maintained in work areas. • Modified Level D PPE to be worn by all those working at and nearby rig includes: hard hat, safety glasses, steel-toed boots, and coveralls or other protective clothing. Those contacting soil cuttings will wear nitrile gloves. • Conduct survey properly to identify all overhead electrical hazards, including electrical hazards in the path of the equipment as it being transported. • Ensure that ground has no hazards such as unstable soil or underground utilities. Conduct underground utility locate before drilling. • Ensure that the findings of the survey and controls for all potential hazards become part of this hazard analysis.

A-5

A-6

PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS
Drilling operations - Inspection of drill rig	Improper inspection of rig could cause workers to be exposed to hazards associated with operating and mechanical device.	<ul style="list-style-type: none"> The rig and all associated equipment will be inspected by the driller's mechanic to be determined in safe operating condition prior to arriving on-site. The SHSS will conduct a safety check of equipment before use and the beginning of each shift. Faulty or unsafe equipment will be tagged and removed from service. No faulty equipment or damaged items will be allowed in the work area. Verify the emergency shutdown system that consists of trip wire located at the right and left rear of the drill (located on each side – one for the driller and one for the driller's helper). Assure that each wire shuts down the system when the trip wire is pulled or pushed. Inspect the brakes and tire pressure on the drill rig. Inspect all cables on the rig. Inspect all hydraulic and pneumatic hoses. Inspect moving parts to ensure that appropriate machine guarding is provided.
Drilling and vacuum truck operations – Set up work area and move rig into position	<p>Failure to review site layout could cause exposure to potential hazards such as electrocution, damaging of underground utilities, tip over of rig in unstable soil conditions.</p> <p>Damage to existing utilities.</p>	<ul style="list-style-type: none"> A reconnaissance of site layout will be conducted to identify potential hazards. The drilling rig will not be moved into any work area until the layout reconnaissance has been completed and the route of travel to any work site has been assessed for hazards (overhead lines, stability of roads and ground). The identified potential physical hazards of the route of travel will be covered at the pre-activity safety briefing along with this activity hazard analysis. Personnel will coordinate utility identification and clearance with NTR prior to start of work. Dig permit will be obtained from BNC prior to any drilling. Assure that weight of rig on ground is evenly distributed and is not so heavy as to damage any underground lines that may be near the surface.

A-7

PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS
	<p>Rig could contact overhead lines, including power lines if it is transported with rig raised.</p> <p>Vehicle may move if not properly set up.</p> <p>When raising rig, rig may not install properly due to the condition of rig and connecting cables.</p> <p>When raising rig, mast could come in contact with or close proximity to overhead power lines causing electrocution of workers.</p> <p>High winds could destabilize rig. Mast could act as a conductor during a thunderstorm.</p> <p>Noise</p> <p>Pinch points</p> <p>Traffic in area of drilling</p>	<ul style="list-style-type: none"> The work area will be inspected and the rig travel, including mast, cannot come within 15 feet of power lines. Use spotter to properly position vehicle. Set brakes and place wheel chocks under front wheels of mobile rig. Extend stabilizer jacks and ensure that footing is sound. Vehicle must be level to the vertical and horizontal planes. Inspect all components of rig to determine condition. Make all repairs before raising rig. Mast and other equipment must be at least 15 feet from any overhead utility lines. Verify the voltage of any overhead power lines. If any lines are above 50 kV, the clearance distance must be greater. Refer to the EM 385-1-1, Section 11, Table 11-1 for clearance required for voltages above 50 kV. Check weather conditions and forecasts to determine if conditions are acceptable for use of rig. Identify the manufacturer's recommended tolerances of the rig for wind prior to work and agree upon a wind speed above which work must be halted. Never raise a mast in an area where lightning is within 3 miles of rig. Earplugs will be worn whenever drill rig or vacuum truck is in operation. Avoid placing hands in places close to moving machinery. Wear gloves, as appropriate. Wear reflective safety vests. Barricade and mark drilling sites for visibility. Use a flag person, if necessary, to direct traffic away from drilling areas. Coordinate with NTR as necessary.

A-8

PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS
Drilling operations—Start-up drill and perform drilling	<p>Pressurized hydraulic lines could rupture causing release of hot hydraulic fluid. Hot fluid can ignite if contact is made with engine. Hot fluid can burn workers. Fluid can cause environmental contamination.</p> <p>Air hoses or hydraulic hoses under pressure could suddenly release, whip, and hit workers, causing severe injury.</p>	<ul style="list-style-type: none"> • Personnel will have been trained in the use of drilling equipment. • Inspect all hydraulic lines before placing rig in service. Any damaged hoses or connections must be replaced before unit is used. • Immediately shut down the equipment. • Ensure that first aid kit is readily available to treat injured workers. • Ensure that a 20-pound dry chemical ABC fire extinguisher is readily available. • A spill control kit consisting of shovel, absorbent material and disposal drum must be available at the drilling location. • As quickly as possible, berm the liquid to minimize the area over which the liquid spreads. • Loose protective clothing will be restrained with duct tape to prevent entanglement in moving parts. • Hands will not be put in areas where parts are moving except as required for drill operation. • Drill rig will be moved with the boom down. • Refer to EHS Procedure 6-2 “Drill Rigs” (Attachment 2) for added safety information. • Do not disconnect air hoses and compressors until hose line has been bled. • Visually inspect all connection of any lines under pressure. Use safety clamps to connect each side of connection to the other in the event the connection breaks (the safety clamps will keep the hoses from whipping under the sudden release of pressure). • Tie back or attach hoses wherever possible to minimize the length of hose that could whip around in the event that there is a sudden release of pressure.

A-9

PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS
	<p>Strains from manually moving materials, equipment, and drums.</p> <p>Atmospheric and contact hazards from chemical agents.</p> <p>Sometimes workers use plastic sheeting in the area where they are drilling to protect the surrounding ground. This sheeting becomes very slippery during precipitation or when wet cuttings are produced from the borehole.</p> <p>The mast could be used to lift other objects as it is being raised causing potential failure of the mast.</p> <p>Workers could climb drill mast and expose themselves to a fall hazard.</p>	<ul style="list-style-type: none"> • Personnel will be directed to use proper lifting techniques such as keeping back straight, lifting with legs, limiting twisting, and getting help in moving bulky/heavy materials and equipment. • Mechanical equipment will be used as much as possible. • Use care when handling augers or drill rods. • Avoid standing under any load. • Get help for lifting any item that weighs 50-pounds or more. • Follow EHS Program 3-1 "Ergonomics" (Attachment 2) • Decontaminate drilling implements after use (or cover contaminated parts when moving to the next drilling site). • Avoid exposure to dust. Use dust control as necessary and possible. • Provide an eye wash station onsite. • PPE including nitrile gloves will be worn to reduce potential exposure • Drum and label all soil cuttings. • Previous drilling at the well locations indicates that PPE, including nitrile gloves, may be disposed of with other solid waste. • Avoid using plastic sheeting, if possible, or use non-slip plastic. Many drillers today build a small bermed area where they place the soil cuttings. It is easier to clean up the surface of the soil than to have workers slip on plastic sheeting. • Masts shall be used in a manner specified by the manufacturer and should never be loaded beyond their capacity. • Climbing on the mast is not allowed without fall protection and approved climbing mechanism, along with a pre-approved Fall Protection Plan provided by the drillers.

A-10

PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS
	<p>Workers could place hands into moving parts of the rig or loose clothing could become entangled in moving machine parts either of which could injure a worker.</p> <p>Workers could injure themselves by cleaning the augers while they are rotating.</p> <p>Workers could trip or fall by the borehole.</p> <p>Pinch points</p>	<ul style="list-style-type: none"> Chains, sprockets, and moving parts will be guarded. Workers will not wear loose clothing, or any jewelry. Workers will not place their hands or any part of their body between the drill auger or rod and the drill plate. Workers should never place themselves in a position where they can come in contact with the moving drill rods or augers. The operator will verbally alert all workers and visually ensure that all workers are clear from dangerous parts of equipment before starting or engaging equipment. Workers will avoid contact with any moving auger. Means will be provided to guard against employee contact with auger. (For example, use barricade of perimeter of auger or electronic brake activated by a presence-sensing device.) Augers will be cleaned only when they are stopped and in neutral. They will not be restarted until the worker has given a verbal all clear to the operator and the operator has visually determined that the worker is clear of the auger. Only long-handled shovels will be used to move cuttings from the auger. Cap and flag open boreholes. All open boreholes will be protected as any open excavation if they are left unattended. (No open boreholes are anticipated because boreholes will be completed as wells.) Avoid placing hands in places close to moving machinery. Wear gloves, as appropriate. Keep constantly alert.
Drilling rig, hand tools, power tools	Daily or before use, inspect tool for damage. An operators manual for the drill rig must be available at the job site.	<ul style="list-style-type: none"> Electrical equipment to be protected by ground fault circuit interrupter (GFCI). Only trained equipment operators may operate heavy equipment; only Department of Motor Vehicles (DMV)-licensed personnel will operate trucks. All drillers and drillers helpers must have documented training on use of rig.

ATTACHMENT 2

EHS PROCEDURES

EHS 3-1: Ergonomics (Previously HS3-1)

Version Date: 05/21/2002 - Revised
Original Issue Date: 02/01/95

Category: Company Procedures

Sub Category: Departmental/Discipline

Keyword: Field

Index: Activities/Environmental
H&S, Monitoring,
Operational Control, Training

Approved by:



Sections: ESQ - Environmental
Health & Safety
Programs

Document Type:

Document Owner: Philip Bartley

Purpose

The purpose of this program is to establish minimum requirements for the implementation of an effective ergonomics program at Tetra Tech EC, Inc. (TtEC). The program is focused on the prevention of cumulative trauma disorders, particularly those associated with the use of computer keyboards and injuries associated with lifting and material handling.

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1.0 PURPOSE

The purpose of this program is to establish minimum requirements for the implementation of an effective ergonomics program at Tetra Tech EC, Inc. (TtEC). The program is focused on the prevention of cumulative trauma disorders, particularly those associated with the use of computer keyboards and injuries associated with lifting and material handling.

2.0 SCOPE

This program applies to all TtEC operations.

3.0 MAINTENANCE

The Executive Director, Environmental, Safety and Quality (ESQ) Programs is responsible for updating this procedure. Approval authority rests with TtEC's President and Chief Executive Officer. Suggestions for revision shall be submitted to both the department responsible for updating the procedure and the Executive Director Compliance and Corporate Counsel.

4.0 DEFINITIONS

4.1 Ergonomics

The science that studies the physical effects of workstations, tools, and equipment on the human body.

4.2 Cumulative Trauma Disorder

A term for health disorders arising from repeated biomechanical stress due to ergonomic hazards. Other terms used include: repetitive motion injury, occupational overuse syndrome, and repetitive strain injury. Cumulative trauma disorders (CTDs) are a class of musculoskeletal disorders involving damage to the tendons, tendon sheaths, synovial lubrication of the tendon sheaths, and the related bones, muscles, and nerves of the hands, wrists, elbows, shoulders, neck and back. Frequently occurring CTDs include: carpal tunnel syndrome, epicondylitis (tennis elbow), tendinitis, tenosynovitis, synovitis, stenosing tenosynovitis of the fingers, DeQuervain's Disease, and low back pain.

4.3 Ergonomic Hazard

A workplace condition that poses a biomechanical stress to the worker. They include, but are not limited to: faulty work station layout, improper work methods, improper tools, excessive tool vibration, and job design problems that include aspects of work flow, posture, work/rest regimens, and repetition rate.

4.4 Ergonomic Risk Factor

A condition of a job or activity that contributes to the risk of developing CTDs. Examples include: repetitiveness of activity, force required, and awkwardness of posture. They are considered in light of their combined effect in inducing CTDs, i.e., risk factors are synergistic element of ergonomic hazards.

4.5 Health Care Provider/Medical Surveillance Program Administrator

A physician/physicians specializing in occupational health, registered nurse specializing in occupational health, or other health personnel working under the supervision of these individuals.

4.6 Qualified Person

A person with thorough training and experience sufficient to identify ergonomic hazards in the workplace and recommend an effective means of correction.

4.7 Systems Approach

A comprehensive program that addresses workplace processes, activities and conditions as interdependent systems in order to identify and to eliminate or reduce all types of hazard, including ergonomic hazards, to employees.

5.0 DISCUSSION

5.1 Responsibilities

5.1.1 Line Management

Line managers are responsible for:

- reviewing and implementing health and safety recommendations which are intended to reduce the probability that ergonomic disorders will occur.
- contacting ESQ to perform an office ergonomic survey when:
 - a new employee is hired
 - an employee moves to another workstation
 - an employee obtains new furniture
 - an employee's assignment changes that significantly increases their computer use
 - an employee informs their supervisor that they are experiencing symptoms which may be associated with their workstation
- ensuring office-based employees receive ergonomic awareness training, conduct workstation self-assessments, and report any physical discomfort or problems with their workstation immediately.

5.1.2 Environmental, Health and Safety Personnel

The Environmental and Safety Coordinator (ESC) for each office or the Environmental and Safety Supervisor (ESS) for each project is responsible for surveying each workplace per the requirements of this programs, to identify ergonomic hazards and to make recommendations, when necessary, for corrective actions to reduce the probability that ergonomic disorders will occur.

The ESC shall also respond to employee or supervisory requests for an ergonomic survey.

5.2 Pre-Placement Medical Evaluations

Pre-placement medical evaluations are not required for office personnel.

TtEC job descriptions contain general information regarding the physical exertion required for each job position including standing, walking, bending, climbing, and lifting. For participants in the TtEC medical surveillance program (hazardous waste workers), per EHS 4-5, Medical Surveillance, this information will assist the Corporate Medical Consultant (CMC) to evaluate an individual's ability to perform the job tasks required by their job position. The objective of this evaluation is to identify pre-existing physical conditions which might be aggravated by routine job duties. The results of the medical evaluation will enable Human Resources and operations personnel to determine when reasonable accommodations can be made to avoid aggravation of pre-existing ergonomic disorders or conditions.

Pre-employment back evaluations are recommended for craft workers who may be at greater risk of developing low back pain or low back injury. This evaluation may be requested by contacting our Corporate Medical Consultant (CMC) and may be performed by the local medical provider under the approval and direction of our CMC.

5.3 Workplace Evaluations

Surveys shall be performed by qualified persons to identify and evaluate tasks which might result in injuries due to ergonomic hazards. The focus of the surveys will be: 1) Computer workstations which are used by a single person on an average of more than 20 hours per week and those which are used by multiple persons, and 2) Operations which involve the manual lifting and moving of objects of excessive weight or asymmetric size.

5.3.1 Computer Workstation Surveys

Workstation Ergonomic Checklist (Attachment A) shall be used for the evaluation of all computer workstations which are used by a single person on an average of more than 20 hours per week or by multiple persons. This checklist is based on guidelines established in the American National Standard for Human Factors Engineering of Visual Display Terminal Workstations.

If the results of the computer workstation survey indicate that the workstation does not meet the desired characteristics or the workstation is not being properly used, recommendations shall be made to modify the workstation and/or provide additional training.

5.3.2 Material Handling

Potential material handling hazards for field operations will be initially identified during the development of Environmental, Health and Safety (EHS) plans pursuant to EHS 3-2, EHS Plans. Potential hazards are to be addressed through the hazard analysis portions of these plans. The effectiveness of the control measures are to be reviewed during

inspections (EHS 3-3, Inspections), ESQ audits (C-2, Audits), and routine observations of workplace activities.

During inspections or audits, or when performing routine observations of workplace activities, Attachment B or an equivalent should be used as a screening tool to identify tasks with ergonomic hazards or risk factors. When ergonomic hazards or risk factors for lifting tasks are identified, the NIOSH "Work Practices Guide for Material Handling" are available as guidelines for evaluating the task.

Recommendations shall be made as necessary to modify the work activity and/or provide additional training. The NIOSH evaluation criteria accounts for the following variables for each lifting task: weight of object, horizontal location, vertical location, vertical travel distance, frequency of lifting, and duration of period of lifting.

5.3.3 Frequency of Workplace Surveys

Computer workstation surveys shall be conducted:

- at least once per year
- for new hires within one month of workstation permanency
- when an employee moves to another workstation
- when an employee obtains new furniture
- when an employee informs their supervisor that they are experiencing symptoms which may be associated with their workstation
- when requested by an employee or his/her supervisor

Material handling surveys will be conducted as part of the TtEC EHS inspection and audit programs, EHS 3-3, Inspections, and C-2, Audits.

5.3.4 Action Items and Follow-up Report

The ESS or ESC shall develop an Action Item and Closure Report (Attachment C or an equivalent) that identifies the recommendations, proposed schedule for implementation and responsible parties. The Operations Manager (for field sites) shall complete and forward the Action Item and Closure Report within 60 days of receipt to the ESS or ESC. The ESS or ESC shall send copies to Manager, EHS Services and to the Director, EHS Services. The ESS or ESC will notify the Operations Manager and manager, EHS Services when Closure Reports are delinquent.

5.3.5 Records

Manager, EHS Services shall maintain copies of all ergonomics surveys and completed Action Item and Closure Reports.

5.4 Hazard Prevention and Control

5.4.1 Workstation Configuration

The recommended design specifications for TtEC work stations are:

- Adequate work space to perform the job;

Consideration of individual body size in relation to design of chair, height of work surface, and access to various elements of the work station, including the monitor screen;

Work surface, monitor and keyboard height within parameters established in the American National Standard for Human Factors Engineering of Visual Display Terminal Workstations (ANSI/HFS 100-1988), or preferably, a height adjustable work station (including capability to adjust monitor height and keyboard height if VDT is used);

Adequate leg room;

No direct reflection of light on screen, adequate illumination (normally 28-50 footcandles), minimum contrast between a monitor screen and the surrounding work area; and

Direction of air supply ducts away from person.

The recommendations for chair design are:

Adjustable seatpan, and lumbar-supportive backrest that can be adjusted for height and depth to individual users;
five legs;
adjustable for height;
laterally and vertically adjustable armrests;
backrest adjustable for tilt and;
chair can swivel

Recommendations for miscellaneous workstation accessories include:

VDT workstations: footrest, natural shaped keyboard, adjustable copy holder, wrist rest, mouse rest, antiglare screen (if needed or wanted).

All newly purchased TtEC workstations, desks, and/or chairs shall meet the above specifications. Existing furniture shall be modified as necessary on the basis of the evaluation using the workstation ergonomic checklist.

5.4.2 Work Practice Controls for Computer Workstations

Work practice controls for workstations include setting the work station up correctly, proper posture, taking eye breaks, and exercises.

The set-up of a VDT workstation should be as follows:

The center of the screen should be at chin level. Position the screen at 14 to 24 inches from the eyes.

Adjust the chair to fit body. Keep the back supported, knees at hip level, feet flat on floor or on a footrest.

Place keyboard low enough so arms hang loosely, shoulders are relaxed, and the upper arm is at a right angle to the forearm.

Set document holder close to screen and at same distance from eyes to avoid frequent head and eye movements and refocusing.

Every 20 minutes, focus on an object at least 20 feet away. Move eyes up down, sideways, and diagonally. Eliminate sources of reflective glare. Correct posture includes holding head and spine upright and sitting well back in the chair - aim buttocks where seat and backrest meet.

Keep wrist in line with hands and forearms. Maintain a light touch on keyboard. Allow hand to rest on mouse.

Support lower arms by using the chair armrests to eliminate need to hold up arms and shoulders.

5.4.3 Material Handling Controls

Material handling equipment such as lift trucks, hand trucks, lift gates, etc. shall be utilized whenever possible.

When mechanical lifting and moving aids cannot be used, team lifting shall be used as a minimum for loads over 50 pounds and for awkward loads. When team lifting is not indicated, personnel are to be trained in and required to use proper lifting techniques.

5.4.4 Hand Tool Selection

Hand tools shall be selected to minimize the following stressors: chronic muscle contraction or steady force, extreme or awkward finger/hand/arm positions, repetitive forceful motions, excessive gripping, pinching, pressing with hand and fingers.

5.5 Personal Protective Equipment

TtEC shall not provide personal protective equipment (PPE) for reducing ergonomic risk factors without the authorization of the CMC or Manager, EHS Services. This includes, but is not limited to, "back" belts, wrist splints, and forearm wraps for "tennis" elbow.

5.6 Training

The employees identified below and supervisors of such employees shall be trained in accordance with the requirements specified in this section.

Employees who use a computer workstation on an average of more than 20 hours per week;

Employees who share work station with multiple persons;

Employees who conduct operations which involve the manual lifting and moving of objects of excessive weight or asymmetric size; and

Employees identified through the ergonomic survey as requiring training.

The training shall be geared toward field or office duties, as appropriate. It shall include, but not be limited to:

Types of ergonomic disorders, especially CTD's and back/upper body strains;

What risk factors cause or contribute to ergonomic disorders;

How to recognize and report symptoms;

Ergonomic hazards associated with their assigned tasks;

Proper workstation design, use, and posture, if applicable;

Proper lifting techniques; and

Work practice controls.

Summary TtEC Ergonomic program with employees.

Employees who experience symptoms/pain possibly associated with their workstation.

This training shall be conducted as part of office or site-specific orientation.

6.0 REFERENCES

ANSI (American National Standards Institute) Human Factors Engineering of Visual Display Terminal Workstations.

Compliance Procedure C-2, Audits

Environmental, Health & Safety - Programs Procedure EHS 3-2, Procedures - Environmental, Health & Safety Plan(s)

Environmental, Health & Safety - Programs Procedure EHS 3-3, Inspections

Environmental, Health & Safety - Programs Procedure EHS 4-5, Medical Surveillance

NIOSH (National Institute for Occupational Safety and Health) Revised Guide for Manual Lifting.

OSHA (U.S. Department of Labor, Occupational Safety and Health Administration) Ergonomics Program Management Guidelines for Meatpacking Plants (1991).

Personal Health Design Bytes of Advice for Comfort and Health, Loudonville, NY (1992).

7.0 ATTACHMENTS

Attachment A - Workstation Ergonomic Checklist

Attachment B - Identification of Ergonomic Risk Factors

Attachment C - Action Item and Closure Report

ATTACHMENT A

WORKSTATION ERGONOMIC CHECKLIST

Location: _____		
Date survey conducted: _____		
Person(s) using workstation: _____		
Average daily use: _____ Less than 4 hours/day _____ 4 or more hours/day		
Maximum hours per day workstation used by one person: _____		
REQUIRED CHARACTERISTICS	YES	NO
Employee had office ergonomics training.		
Light sources and light colored documents are not seen as reflections on screen.		
Monitor can be positioned to avoid glare.		
Monitor has glare screen.		
Top third of monitor screen is no higher than eye height.		
Employee with bifocals/trifocals is able to see screen without bending head or neck up/backward.		
Angle of monitor can be adjusted and is within 18-24 inches from operator eyes.		
Monitor, keyboard and mouse are aligned in front of operator allowing operator to view monitor directly w/o turning head.		
Keyboard/mouse height is adjustable and can be used with shoulders, arms & wrists in a neutral position.		
Mouse is on the same level as the keyboard.		
Mouse shape & button activation is comfortable and easy to operate. Fingers rest softly on mouse and are not held above mouse.		
Reaching for and operating the mouse greater than 90° arm extension is avoided.		
Armrests of chair or desk, support forearms/elbows while employee performs workstation tasks.		
Forearms are approximately parallel to the ground when using keyboard.		
Does the employee use the mouse extensively (i.e., more frequently than the keyboard)? For example, the mouse may be used as the primary input device for CADD, graphics, and spreadsheet tasks.		
Hands/wrists/lower arms do not rest on sharp or hard edge while typing.		
Chair seat pan angle and height are adjustable while seated.		
Chair backrest angle and height are adjustable while seated.		
Chair can swivel.		
Chair base has 5 spokes.		
Chair armrests are height and laterally adjustable.		

Wrist rest for mouse or keyboard is desired by employee or is needed (circle those that apply).		
Foot rest desired by employee or is needed.		
There is adequate leg clearance for the operator beneath the working surface.		
Document holder is desired by employee or is needed. If present, holder is adjustable for height and angle.		
Employee frequently uses telephone while using computer.		
Telephone can be used with head upright (not tilted) and shoulders relaxed (not elevated) if employee does workstation tasks at same time. Employee uses which of the following: shoulder rest, head set, speaker phone		
Forced air and air conditioning ducts are directed away from employee		
Does employee have any special needs due to physical limitations, height or unusual computer usage? Explain: _____ _____ _____		

Survey conducted by: _____

Reason for survey: Annual:___ New employee:___ Office move:___ Employee complaint (explain):___ Follow-up:___

Other: _____

Comments: _____

Recommendations: _____

ATTACHMENT B

IDENTIFICATION OF ERGONOMIC RISK FACTORS

PROJECT OR OFFICE _____		TASK/AREA _____	
SURVEY PERFORMED BY _____		DATE _____	
RISK FACTOR	PRESENT	NOT PRESENT	COMMENT/CONTROLS BEING UTILIZED
Lifting or moving objects of excessive weight or asymmetric size			
Repetitive and/or prolonged activities			
Awkward postures of the upper body (reaching above the shoulder or behind the back, twisting the wrists or other joints)			
Forceful exertions (usually with hands)			
Prolonged static posture			
Continued physical contact with work surfaces (e.g., contact with edges)			
Excessive vibration			
Cold temperatures			
Inappropriate or inadequate hand tools			
Slippery footing			
Other (identify here):			
Employee questions/comments	NA	NA	

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ATTACHMENT C

ERGONOMICS ACTION ITEM AND CLOSURE REPORT

Office or Project:

Date(s) of Survey(s):

RECOMMENDATION	ACTION ITEM	RESPONSIBLE PARTY	SCHEDULE	DATE COMPLETED
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				

Reviewed by: _____

Operations or Project Manager

_____ Date

Please return completed form to ESS or ESC within 60 days.

Copies to: EHS Services Manager / Director, EHS Services

EHS 6-2: Drill Rigs (Previously HS6-3)

Version Date: 03/19/98 - Revised
Original Issue Date: 02/01/95

Category: Company
Procedures
Sub Category:
Departmental/Discipli
ne

Purpose

The purpose of this
program is to establish
drilling safety guidelines.

Keyword EHS
Index: Compliance/Waste
Management, Field
Activities/Science,
Operational Control,
Training

Approved by:



Sections: ESQ - Environmental
Health & Safety Programs

Document Type: Procedure

Document Owner: Philip Bartley

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6.0 REFERENCES

1.0 PURPOSE

The purpose of this program is to establish drilling safety guidelines.

2.0 SCOPE

The requirements of this program apply to all drillers and drilling subcontractors working on Tetra Tech EC, Inc. (TtEC) projects. This program contains requirements for drilling, servicing and related operations performed in support of monitoring well installation and geological exploration, and addresses hazards associated with assembling and disassembling rigs, rotary and auger drilling, and grouting.

3.0 MAINTENANCE

The Director, Environmental, Safety and Quality (ESQ) Programs is responsible for updating this procedure. Approval authority rests with TtEC's President and Chief Executive Officer. Suggestions for revision shall be submitted to both the department responsible for updating the procedure and the Executive Director Compliance and Corporate Counsel.

4.0 DEFINITIONS

4.1 Annular Space

The space surrounding the pipe suspended in the wellbore. The outer wall of the annular space may be an open hole or it may be larger pipe.

4.2 Auger Rig

Drilling method in which a hole is drilled by rotating a corkscrew type hollow stem steel drill.

4.3 Cable Tool Drilling

Drilling method in which hole is drilled by advancing a drive barrel and/or hand tool. As the hole is advanced a steel casing is driven by a cable to prevent collapse.

4.4 Cathead

A spool-shaped extension of the draw works shaft used to lift heavy equipment and to make up or break out drill pipe.

4.5 Cribbing

Logs, 2 X 4s or other non-compressible material used to support an object above the ground/floor.

4.6 Cuttings

Soil or other particles obtained during drilling operations. Cuttings are brought to the surface by circulating mud-laden fluid in rotary drilling or by hollow stem auger drilling. They are bailed out in cable tool drilling.

4.7 Derrick

Any one of a large number of types of load-bearing structures. In drilling work, the standard derrick has four legs standing at the corners of the substructure and reaching to the crown block. The substructure is an assembly of heavy beams used to elevate the derrick above the ground and provide space to install blowout preventers, casing heads, etc. The standard derrick has largely been replaced by the mast for drilling. The mast is lowered and raised without disassembly.

4.8 Mud

The liquid that is circulated through the wellbore during rotary drilling and workover operations. In addition to its function of bringing cuttings to the surface, mud also cools and lubricates the bit and drill string, protects against blowouts by containing subsurface pressures, and deposits a mud cake on the wall of the borehole to prevent loss of fluids to the formations. Although it originally was a suspension of earth solids, especially clays, in water, the mud used in modern drilling operations is a somewhat more complex three-phase mixture of liquids, reactive solids, and inert solids. The liquid phase may be fresh water, diesel oil, or crude oil and may contain one or more conditioners.

4.9 Rotary Drilling

The drilling method by which a hole is drilled by a rotating bit to which a downward force (drill collars) is applied. The bit is fastened to and rotated by the drill stem, which also provides a passage for the circulating fluid.

4.10 Sheave

A wheel or disc with a grooved rim, especially one used as a pulley.

5.0 DISCUSSION

5.1 Responsibilities

5.1.1 All TtEC Employees and Subcontractor Personnel

All TtEC personnel are responsible for understanding and complying with the requirements of this program. They should bring all perceived, potential or actual unsafe site conditions to the attention of the Environmental and Safety Supervisor (ESS) during site safety meetings. Drillers are required to have their own drilling safety plan on-site which shall reference and comply with this procedure.

5.1.2 Line Management

The Project Manager (PM) is responsible for selecting a qualified drilling subcontractor for the project and has overall responsibility for the health and safety of all TtEC and subcontractor employees on the job site. The PM shall include this procedure and other appropriate health and safety requirements in all drilling specifications.

5.2 Housekeeping

The drilling safety supervisor shall understand and fulfill the responsibility for proper maintenance and good "housekeeping" on and around the drill rig. These requirements include, but are not limited to:

- Provide suitable storage locations for all tools, materials and supplies so that tools, materials and supplies can be conveniently and safely handled without hitting or falling on a member of the drill crew or a visitor.
- Avoid storing or transporting tools, materials or supplies within or on the mast (derrick) of the drill rig.
- Neatly stack pipe, drill rods, casing augers and similar drilling tools on racks or sills to prevent spreading, rolling or sliding.
- Place penetration or other driving hammers at a safe location on the ground or secure them to prevent movement when not in use.
- Keep work areas, platforms, walkways, scaffolding and other access ways free of materials, debris, and obstructions and substances such as ice, grease or oil that could cause a surface to become slick or otherwise hazardous.
- Keep all controls, control linkages, warning and operation lights and lenses free of oil, grease and/or ice.
- Do not store gasoline in any portable container other than a non-sparking, approved container with a flame arrester in the fill spout and having the word "gasoline" easily visible. A hazard communication label shall also be placed on all gasoline cans. (See EHS 4-2, Hazard Communications, and EHS 3-7, Hazardous Material Storage and Transportation.)

5.3 Maintenance

Proper maintenance will make drilling operations safer. Maintenance should be performed safely. These requirement include, but are not limited to:

- Keep drill rigs and associated equipment in good condition.
- Wear safety glasses when performing maintenance on a drill rig or on drilling tools.
- Shut down the drill rig engine to make repairs or adjustments to a drill rig or to lubricate fittings (except repairs or adjustments that can only be made with the engine running). Take precautions to prevent accidental starting of an engine during maintenance by locking, removing or tagging the ignition key (see EHS 6-4 Lockout/Tagout Procedure).
- Always block the wheels or lower the leveling jacks or both and set hand brakes before working under a drill rig.

- When possible and appropriate, release all pressure on the hydraulic systems, the drilling fluid system and the air pressure systems of the drill rig prior to performing maintenance. In other words, reduce the drill rig and operating systems to a "zero energy state" before performing maintenance. Use extreme caution when opening drain plugs and radiator caps and other pressurized plugs and caps.
- Do not touch an engine or the exhaust system of an engine following its operation until the engine and exhaust system have had adequate time to cool.
- Never weld or cut on or near a fuel tank.
- Do not use gasoline or other volatile or flammable liquids as a cleaning agent on or around a drill rig.
- Follow the manufacturer's recommendations for applying the proper quantity and quality of lubricants, hydraulic oils and/or coolants.
- Replace all caps, filler plugs, protective guards or panels and high pressure hose clamps and chains or cables that have been removed for maintenance before returning the drill rig to service.
- Check the deadman switch daily. Ensure that its location is known to all drill rig crew personnel.

5.4 Hand Tools

There are almost an infinite number of hand tools that can be used on or around a drill rig and in repair shops and more than an equal number of instructions for proper use. "Use the tool for its intended purpose" is the most important rule. The following are a few specific and some general suggestions which apply to safe use of hand tools that are often used on and around drill rigs.

- When a tool becomes damaged, either repair it before using it again or discard it.
- When using a hammer wear safety glasses and require all others around you to wear safety glasses.
- When using a chisel wear safety glasses and require all others around you to wear safety glasses.
- Keep all tools cleaned and neatly stored when not in use.
- Use wrenches on nuts - do not use pliers on nuts.
- Use screwdrivers with blades that fit the screw slot.
- When using a wrench on a tight nut - first use some penetrating oil, use the largest wrench available that fits the nut, when possible pull on the wrench handle rather than pushing, and apply force to the wrench with both hands when possible and with both feet firmly placed. Don't push or pull with one or both feet on the drill rig or

the side of a mud pit or some other blocking-off device. Always assume that you may lose your footing - check the place where you may fall for sharp objects.

- Keep all pipe wrenches clean and in good repair. The jaws of pipe wrenches should be wire brushed frequently to prevent an accumulation of dirt and grease which would otherwise build up and cause wrenches to slip.
- Never use pipe wrenches in place of a rod holding device.
- Replace hook and heel jaws when they become visibly worn.
- When breaking tool joints on the ground or on a drilling platform, position your hands so that your fingers will not be smashed between the wrench handle and the ground or the platform, should the wrench slip or the joint suddenly let go.

5.5 Clearing the Work Area

Prior to drilling, perform adequate site clearing and leveling to accommodate the drill rig and supplies and provide a safe working area. Drilling shall not be commenced when tree limbs, unstable ground or site obstructions cause unsafe tool handling conditions.

5.6 Start-up

- Instruct all visitors to "stand clear" of the drill rig immediately prior to and during starting of any an engine.
- Make sure all gear boxes are in neutral, all hoist levers are disengaged, all hydraulic levers are in the correct non-actuating positions and the cathead rope is not on the cathead before starting a drill rig engine.
- Start all engines according to the manufacturer's manual.

5.7 Safety During Drilling Operations

- Safety requires the attention and cooperation of every worker and site visitor.
- Do not drive the drill rig from hole to hole with the mast (derrick) in the raised position.
- Before raising the mast (derrick), look up to check for overhead obstructions.
- Maintain a minimum of 15 ft clearance from all overhead electric lines. See Army Corps of Engineers, EM 385-1-1, Section 11.E for additional guidance on operations adjacent to overhead lines.
- Before raising the mast (derrick), all drill rig personnel (with the exception of the operator) and visitors shall be cleared from the areas immediately to the rear and the sides of the mast. All drill rig personnel and visitors shall be informed that the mast is being raised prior to raising it.

- Before the mast (derrick) of a drill rig is raised and drilling is commenced, the drill rig must first be leveled and stabilized with leveling jacks and/or solid cribbing. The drill rig shall be re-leveled if it settles after initial set up. Lower the mast (derrick) only when the leveling jacks are down and do not raise the leveling jack pads until the mast (derrick) is lowered completely.
- Before starting drilling operations, secure and/or lock the mast (derrick) if required according to the drill manufacturer's recommendations.
- The operator of a drill rig shall only operate a drill rig from the position of the controls. If the operator of the drill rig must leave the area of the controls, the operator shall shift the transmission controlling the rotary drive into neutral and place the feed control lever in neutral. The operator shall shut down the drill engine before leaving the vicinity of the drill rig.
- Throwing or dropping tools shall not be permitted. All tools shall be carefully passed by hand between personnel or a hoist line shall be used.
- Do not consume alcoholic beverages or other depressants or chemical stimulants prior to starting work on a drill rig or while on the job.
- When encountering a "hot spot" during drilling operations involving volatiles, vacate the immediate area and allow the borehole to vent. Resume work after monitoring instruments indicate an atmosphere in compliance with the site-specific EHS Plan.
- If it is necessary to drill within an enclosed area, make certain that exhaust gases are vented out of the area. Exhaust gases can be toxic and some cannot be detected by smell.
- Clean mud and grease from your boots before mounting a drill platform and use hand holds and railings. Watch for slippery ground when dismounting from the platform.
- During freezing weather, do not touch any metal parts of the drill rig with exposed flesh. Freezing of moist skin to metal can occur almost instantaneously.
- All air and water lines and pumps should be drained when not in use if freezing weather is expected.
- All unattended boreholes must be adequately covered or otherwise protected to prevent drill rig personnel, site visitors or animals from stepping or falling into the hole. All open boreholes shall be covered, protected or backfilled adequately and according to local or state regulations on completion of the drilling project.
- "Horsing around" within the vicinity of the drill rig and tool and supply storage areas is not allowed, even when the drill rig is shut down.
- When using a ladder on a drill rig, face the ladder and grasp either the side rails or the rungs with both hands while ascending or descending. Do not attempt to use one or both hands to carry a tool while on a ladder. Use a hoist line and a tool "bucket" or a safety hook to raise or lower hand tools.

- Use elevated derrick platforms with the following precautions:
 - When working on a derrick platform, use a safety harness and a lifeline. The safety harness shall be at least four inches (100 mm) wide and shall fit snugly but comfortably. The lifeline, when attached to the derrick, shall be less than six feet (2 m) long. The safety harness and lifeline shall be strong enough to withstand the dynamic force of a 250 pound (115 kg) weight (contained within the belt) falling six feet (2 m).
 - When climbing to a derrick platform that is higher than 20 feet (6 m), use a safety climbing device.
 - When a rig worker is on a derrick platform, fasten the lifeline to the derrick just above the derrick platform and to a structural member that is not attached to the platform or to other lines or cables supporting the platform.
 - When a rig worker first arrives at a derrick platform, inspect the platform for broken members, loose connections and loose tools or other loose materials.
 - Attach tools securely to the platform with safety lines. Do not attach a tool to a line attached to your waist or any other part of your body.
 - When you are working on a derrick platform, do not guide drill rods or pipe into racks or other supports by taking hold of a moving hoist line or a traveling block.
 - Do not leave loose tools and similar items on the derrick platform or on structural members of the derrick.
 - A derrick platform over four feet (1.2 m) above ground surface shall be equipped with toe boards and safety railings that are in good condition.
 - Workers on the ground or the drilling floor shall avoid working under rig workers on elevated platforms, whenever possible.
- Terminate drilling operations during an electrical storm and move the entire crew away from the drill rig.

5.8 Safe Use of Wire Line Hoists, Wire Rope and Hoisting Hardware

- The use of wire line hoists, wire rope and hoisting hardware shall be as stipulated by 29 CFR 1910, 29 CFR 1926, and the American Iron Steel Institute Wire Rope Users Manual.
- Visually inspect all wire ropes and fittings during use and thoroughly inspect them at least once a week for: abrasion, broken wires, wear, reduction in rope diameter, reduction in wire diameter, fatigue, corrosion, damage from heat, improper reeving, jamming, crushing, bird caging, kinking, core protrusion and damage to lifting hardware. Replace wire ropes when inspection indicates excessive damage according to the Wire Rope Users Manual. Thoroughly inspect all wire ropes which have not been used for a period of a month or more before returning them to service.

- End fittings and connections consist of spliced eyes and various manufactured devices. Install all manufactured end fittings and connections according to the manufacturer's instructions and follow the manufacturer's load specifications.
- If a ball-bearing type hoisting swivel is used to hoist drill rods, inspect and lubricate the swivel daily to assure that the swivel freely rotates under load.
- If a rod slipping device is used to hoist drill rods, do not drill through or rotate drill rods through the slipping device, do not hoist more than 1 foot (0.3 m) of the drill rod column above the top of the mast (derrick), do not hoist a rod column with loose tool joints and do not make up, tighten or loosen tool joints while the rod column is being supported by a rod slipping device. If drill rods should slip back into the borehole, do not attempt to break the fall of the rods with your hands or by tensioning the slipping device.
- Most sheaves on exploration drill rigs are stationary with a single part line. Never increase the number of parts of line without first consulting with the manufacturer of the drill rig.
- Wire ropes must be properly matched with each sheave - if the rope is too large, the sheave will pinch the wire rope - if the rope is too small, it will groove the sheave. Once the sheave is grooved, it will severely pinch and damage larger sized wire ropes.
- The following procedures and precautions must be understood and implemented for safe use of wire ropes and rigging hardware:
 - Use tool handling hoists only for vertical lifting of tools (except when angle hole drilling). Do not use tool handling hoists to pull objects away from the drill rig; however, drills may be moved using the main hoist if the wire rope is spooled through proper sheaves according to the manufacturer's recommendations.
 - When stuck tools or similar loads cannot be raised with a hoist, disconnect the hoist line and connect the stuck tools directly to the feed mechanism of the drill. Do not use hydraulic leveling jacks for added pull to the hoist line or the feed mechanism of the drill.
 - When attempting to pull out a mired down vehicle or drill rig carrier, only use a winch on the front or rear of the vehicle and stay as far away as possible from the wire rope. Do not attempt to use tool hoists to pull out a mired down vehicle or drill rig carrier.
 - Minimize shock loading of a wire rope - apply loads smoothly and steadily.
 - Avoid sudden loading in cold weather.
 - Never use frozen ropes.
 - Protect wire rope from sharp corners or edges.

- Replace faulty guides and rollers.
- Replace damaged safety latches on safety hooks before using.
- Know the safe working load of the equipment and tackle being used. Never exceed this limit.
- Inspect and test clutches and brakes of hoists periodically.
- Know and do not exceed the rated capacity of hooks, rings, links, swivels, shackles and other lifting aids.
- Always wear gloves when handling wire ropes.
- Do not guide wire rope on hoist drums with your hands.
- Following the installation of a new wire rope, first lift a light load to allow the wire rope to adjust.
- Never carry out any hoisting operations when the weather conditions are such that hazards to personnel, the public, or property are created.
- Never leave a load suspended in the air when the hoist is unattended.
- Keep your hands away from hoists, wire rope, hoisting hooks, sheaves and pinch points as slack is being taken up and when the load is being hoisted.
- Never hoist the load over the head, body or feet of any personnel.
- Never use a hoist line to "ride" up the mast (derrick) of a drill rig.
- Replacement wire ropes should conform to the drill rig manufacturer's specifications.

5.9 Safe Use of Cathead and Rope Hoists

The following safety procedures shall be employed when using a cathead hoist:

- Keep the cathead clean and free of rust and oil and/or grease. Clean the cathead with a wire brush if it becomes rusty.
- Check the cathead periodically, when the engine is not running, for rope wear grooves. Replace the cathead if a rope groove forms to a depth greater than 1/8 inch (3 mm).
- Always use a clean, dry, sound rope. A wet or oily rope may "grab" the cathead and cause drill tools or other items to be rapidly hoisted to the top of the mast.
- Should the rope "grab" the cathead or otherwise become tangled in the drum, release the rope and sound an appropriate alarm for all personnel to rapidly back away and stay clear. The operator shall also back away and stay clear. If the rope

"grabs" the cathead, and tools are hoisted to the sheaves at the top of the mast, the rope will often break, releasing the tools. If the rope does not break, stay clear of the drill rig until the operator cautiously returns to turn off the drill rig engine and appropriate action is taken to release the tools. The operator shall keep careful watch on the suspended tools and shall quickly back away after turning off the engine.

- The rope shall always be protected from contact with all chemicals. Chemicals can cause deterioration of the rope that may not be visibly detectable.
- Never wrap the rope from the cathead (or any other rope, wire rope or cable on the drill rig) around a hand, wrist, arm, foot, ankle, leg or any other part of your body.
- Always maintain a minimum of 18 inches of clearance between the operating hand and the cathead drum when driving samplers, casing or other tools with the cathead and rope methods. Be aware that the rope advances toward the cathead with each hammer blow as the sampler or other drilling tool advances into the ground.
- Never operate a cathead (or perform any other task around a drill rig) with loose unbuttoned or otherwise unfastened clothing or when wearing gloves with large cuffs or loose straps or lacing.
- Do not use a rope that is any longer than necessary. A rope that is too long can form a ground loop or otherwise become entangled with the operator's legs.
- Do not use more rope wraps than are required to hoist a load.
- Do not leave a cathead unattended with the rope wrapped on the drum.
- Position all other hoist lines to prevent contact with the operating cathead rope.
- When using the cathead and rope for driving or back-driving, make sure that all threaded connections are tight and stay as far away as possible from the hammer impact point.
- The cathead operator must be able to operate the cathead standing on a level surface with good, firm footing conditions without distraction or disturbance.

5.10 Safe Use of Augers

The following general procedures shall be used when starting a boring with a continuous flight or hollow-stem augers:

- Prepare to start an auger boring with the drill rig level, the clutch or hydraulic rotation control disengaged, the transmission in low gear and the engine running at low RPM.
- Apply an adequate amount of down pressure prior to rotation to seat the auger head below the ground surface.

- Look at the auger head while slowly engaging the clutch or rotation control and starting rotation. Stay clear of the auger.
- Slowly rotate the auger and auger head while continuing to apply down pressure. Keep one hand on the clutch or the rotation control at all times until the auger has penetrated about one foot or more below ground surface.
- If the auger head slides out of alignment, disengage the clutch or hydraulic rotation control and repeat the hole starting process.
- An auger guide can facilitate the starting of a straight hole through hard ground or pavement.
- The operator and tool handler shall establish a system of responsibility for the various activities required for auger drilling, such as connecting and disconnecting auger sections, and inserting and removing the auger fork. The operator must assure that the tool handler is well away from the auger column and that the auger fork is removed before starting rotation.
- Only use the manufacturer's recommended method of securing the auger to the power coupling. Do not touch the coupling or the auger with your hands, a wrench or any other tools during rotation.
- Whenever possible, use tool hoists to handle auger sections.
- Never place hands or fingers under the bottom of an auger section when hoisting the auger over other auger sections or other hard surfaces such as the drill rig platform.
- Never allow feet to get under the auger section that is being hoisted.
- When rotating augers, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason whatsoever.
- Use a long-handled shovel to move auger cuttings away from the auger. Never use your hands or feet to move cuttings away from the auger.
- Do not attempt to remove earth from rotating augers. Augers should be cleaned only when the drill rig is in neutral and the augers are stopped from rotating.

5.11 Safety During Rotary and Core Drilling

- Rotary drilling tools shall be safety checked prior to drilling:
 - Lubricate and check water swivels and hoisting plugs for "frozen" bearings before use. Use only approved lubrication fluids.
 - Check drill rod chuck jaws periodically and replace when necessary.

- Check the capacities of hoists and sheaves against the anticipated weight to the drill rod string plus other expected hoisting loads.
- Special precautions for safe rotary or core drilling involve chucking, joint break, hoisting and lowering of drill rods:
 - Only the operator of the drill rig shall brake or set a manual chuck so that rotation of the chuck will not occur prior to removing the wrench from the chuck.
 - Do not brake drill rods during lowering into the hole with drill rod chuck jaws.
 - Do not hold or lower drill rods into the hole with pipe wrenches.
 - If a string of drill rods are accidentally or inadvertently released into the hole, do not attempt to grab the falling rods with your hands or a wrench.
 - In the event of a plugged bit or other circulation blockage, relieve or bleed down the high pressure in the piping and hose between the pump and the obstruction before breaking the first tool joint.
 - When drill rods are hoisted from the hole, they shall be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use your hands to clean drilling fluids from drill rods.
 - If work must progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit shall be equipped with rough surfaced, fitted cover panels of adequate strength to hold drill rig personnel.
 - Do not lean unsecured drill rods against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay the rods down.

5.12 Engines and Pumps

- The following engine and pump stop devices are as follows:
 - For an internal-combustion engine: an ignition or grounding switch.
 - For a diesel engine: a quick-closing valve or equivalent device which will shut off the air to the air-intake manifold of the engine and prevent entry of gas-laden air, or a means of releasing the engine compression which will not produce an open flame or spark.
 - For an electric motor: a suitable switch in the motor circuit, or a switch or stop button in the control circuit, approved for the location in which it is installed.
- Mud pumps shall be equipped with a pressure relieving device set to release within the limits of the safe working pressure of the pump. Such devices include direct spring-loaded safety valves, shear-pin safety valves, and rupture disks.

- There shall be no valve between the pump and its pressure-relieving device. The point of discharge from a pressure-relieving device shall be located where employees are not endangered by the discharge of fluids.
- Each pump shall be equipped with bleeder valves.
- All personnel involved in the operation of the rig shall know the exact location of each stop device.

5.13 Safety During Travel

- The individual who transports a drill rig on and off a drilling site shall:
 - Be properly licensed and shall only operate the vehicle according to federal, state and local regulations.
 - Know the traveling height (overhead clearance), width, length and weight of the drill rig with carrier and know the highway and bridge load, width and overhead limits, making sure these limits are not exceeded and allowing an adequate margin of safety.
 - Never move a drill rig unless the vehicle brakes are in sound working order.
 - Allow for mast overhang when cornering or approaching other vehicles or structures.
 - Be aware that the canopies of service stations and motels are often too low for a drill rig mast to clear with the mast in the travel position.
 - Watch for low hanging electrical lines, particularly at the entrances to drilling sites or restaurants, motels or other commercial sites.
 - Never travel on a street, road, highway with the mast (derrick) of the drill rig in the raised or partially raised position.
 - Remove all ignition keys when a drill rig is left unattended.

5.14 Off-Road Movement

- The following safety precautions relating to off-road movement shall be followed:
 - Before moving a drill rig, first walk the route of travel, inspecting for depressions, stumps, gullies, ruts and similar obstacles.
 - Always check the brakes of a drill rig carrier before traveling, particularly on rough, uneven or hilly ground.
 - Check the complete drive train of a carrier at least weekly for loose or damaged bolts, nuts, studs, shafts and mountings.
 - Discharge all passengers before moving a drill rig on rough or hilly terrain.

- Engage the front axle (for 4 x 4, 6 x 6, etc. vehicles or carriers) when traveling off highway on hilly terrain.
- Use caution when traveling a side-hill. Conservatively evaluate side-hill capability of drill rigs, because the arbitrary addition of drilling tools may raise the center of gravity. When possible, travel directly uphill or downhill. Increase tire pressures before traveling in hilly terrain (do not exceed rated tire pressure).
- Attempt to cross obstacles such as small logs and small erosion channels or ditches squarely, not at an angle.
- Use the assistance of someone on the ground as a guide when lateral or overhead clearance is close.
- After the drill rig has been moved to a new drilling site, set all brakes and/or locks and block wheels.
- Never travel off-road with the mast (derrick) of the drill rig in the raised or partially raised position.

5.15 Tires, Batteries and Fuel

- Tires on the drill rig must be checked daily for safety and during extended travel for loss of air and they must be maintained and/or repaired in a safe manner. If tires are deflated to reduce ground pressure for movement on soft ground, the tires should be reinflated to normal pressures before movement on firm or hilly ground or on streets, roads and highways. Under inflated tires are not as stable on firm ground as properly inflated tires. Air pressures shall be maintained for travel on streets, roads and highways according to the manufacturer's recommendations. During air pressure checks, inspect for:
 - Missing or loose wheel lugs
 - Objects wedged between duals or embedded in the tire casing
 - Damaged or poorly fitting rims or rim flanges
 - Abnormal or uneven wear and cuts, breaks or tears in the casing.
- The repair of truck and off-highway tires shall only be made with required special tools following the recommendations of a tire manufacturer's repair manual. If they are split rim tires, repairs shall be performed using an appropriate tire cage device.
- Batteries contain strong acid. Use extreme caution when servicing batteries.
 - Batteries shall only be serviced in a ventilated area while wearing safety glasses.
 - When a battery is removed from a vehicle or service unit, disconnect the battery ground clamp first.

- When installing a battery, connect the battery ground clamp last.
- When charging a battery with a battery charger, turn off the power source to the battery before either connecting or disconnecting charger leads to the battery posts. Loosen cell caps prior to charging to permit the escape of gas.
- Spilled battery acid can burn your skin and damage your eyes. Spilled battery acid shall be immediately flushed off your skin with lots of water. Should battery acid get into someone's eyes, flush immediately with large amounts of water and see a medical physician at once.
- To avoid battery explosions, keep the cells filled with electrolyte, use a flashlight (not an open flame) to check electrolyte levels, and avoid creating sparks around the battery by shorting across a battery terminal. Keep lighted smoking materials and flames away from batteries.
- Special precautions must be taken for handling fuel and refueling the drill rig or carrier.
 - Only use the type and quality of fuel recommended by the engine manufacturer.
 - Refuel in a well-ventilated area.
 - Do not fill fuel tanks while the engine is running. Turn off all electrical switches.
 - Do not spill fuel on hot surfaces. Clean any spillage before starting an engine.
 - Wipe up spilled fuel with cotton rags or cloths - do not use wool or metallic cloth.
 - Keep open lights, lighted smoking materials and flames or sparking equipment well away from the fueling area.
 - Turn off heaters in carrier cabs when refueling the carrier or the drill rig.
 - To allow for expansion of the fuel during temperature changes, do not fill portable fuel containers completely full.
 - Keep the fuel nozzle in contact with the tank being filled to prevent static sparks from igniting the fuel.
 - Do not transport portable fuel containers in the vehicle or carrier cab with personnel.
 - Fuel containers and hoses shall remain in contact with a metal surface during travel to prevent the buildup of static charge.

5.16 Drill Rig Utilization and Alterations

- Do not attempt to exceed manufacturer's ratings of speed, force, torque, pressure, flow, etc. Only use the drill rig and tools for the purposes which they are intended and designed.

- Alterations to a drill rig or drilling tools shall only be made by qualified personnel and only after consultation with the manufacturer.

6.0 REFERENCES

29 CFR 1910
29 CFR 1926
American Iron Steel Institute, Wire Rope Users Manual
Drilling Safety Guide. 3008 Millwood Avenue, Columbia, S.C. 29205.
Environmental, Health & Safety - Programs Procedure EHS 2-1, Emergency
Preparedness
Environmental, Health & Safety - Programs Procedure EHS 3-7, Hazardous Material
Storage and
Transportation
Environmental, Health & Safety - Programs Procedure EHS 4-2, Hazard
Communication
Environmental, Health & Safety - Programs Procedure EHS 6-4, Lockout/Tagout
National Drilling Federation
OSHA (Occupational Safety and Health Administration)
USACOE (U.S. Army Corps of Engineers), EM 385-1-1, 11.E, Operations Adjacent to
Overhead Lines. Safety and Health Requirements Manual.

APPENDIX B

ADDENDUM TO FINAL QUALITY CONTROL PLAN

CONTRACT NO. N44255-05-D-5001
TASK ORDER 0001

ADDENDUM TO FINAL QUALITY CONTROL PLAN

LONG-TERM MONITORING FOR OU A, OU B T,
OU C, OU NSC, AND PMP

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON

DECEMBER 12, 2005

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Table 4-1. Sampling and Analysis Frequency and Analytical Parameters for BNC OUs

Location	Frequency	TSS 160.2	NWTP H-Gx	NWTP H-Dx	TCE 8260B	Pesticides 8081A Low Level	BTEX 8021B	Dissolved Metals 6020	Total Mercury 7470	Total Metals 6020
OU A	Semi-Annual									X
OU B T	Quarterly				X	X		X	X	
OU C	Quarterly	X	X	X						
OU NSC	Semi-Annual	X								X
Background	Semi-Annual	X	X	X						X
PMP	Semi-Annual	X	X	X			X			

Clarifications regarding total number of sample analyses and target analytes are as follows:

OU A –The target analytes for total metals include arsenic, copper, lead, nickel, and zinc.

OU B T – The target analytes for pesticides include 4,4'-DDE; 4,4'-DDT; aldrin; dieldrin; and heptachlor epoxide. The target analytes for total metals includes mercury; while target analytes for dissolved metals include arsenic, copper, lead, nickel, and zinc. If free-petroleum-related product is present in a well, a product or product/water sample will be collected for analysis of Total PCB Aroclors by EPA Method 8082. If PCBs are not detected, PCB analysis will be discontinued.

OU C – Samples will be analyzed quarterly for 3 quarters during the TO period of performance (Oct 05, Jan 06, April 06).

OU NSC – The target analytes for total metals include arsenic, copper, lead, and nickel.

Background – Monitoring will be conducted at well 346 coincident with OU NSC monitoring.

Table 4-2. Laboratory Analyses and Containers, Preservation, and Holding Time Requirements for Groundwater Samples

Analysis	Method	Sample Container^{1/} 2/	Preservation	Holding Time
Total Suspended Solids	160.2	1 L plastic	Cool to 4°C ± 2°C	7 days
TPH-gasoline range	NWTPH-Gx	Three x 40 mL glass vials (Teflon® septum lid)	HCl to pH < 2; Cool to 4°C ± 2°C; No headspace	14 days (7 days if unpreserved)
TPH-diesel extended range	NWTPH-Dx	1 L glass	HCl to pH < 2; Cool to 4°C ± 2°C	7 days to extraction, 40 days to analysis
Trichloroethene	8260B	Three x 40 mL glass vials (Teflon® septum lid)	HCl to pH < 2; Cool to 4°C ± 2°C; No headspace	14 days
Pesticides	8081A Low Level	1 L glass	Cool to 4°C ± 2°C	7 days to extraction, 40 days to analysis
PCB Aroclors	8082	1 L glass	Cool to 4°C ± 2°C	7 days to extraction, 40 days to analysis
BTEX	8021B	Three x 40 mL glass vials (Teflon® septum lid)	HCl to pH < 2; Cool to 4°C ± 2°C; No headspace	14 days
Total metals, except mercury	6010/6020	1 L plastic	HNO ₃ to pH < 2	6 months
Dissolved metals, except mercury	6010/6020	1 L plastic	HNO ₃ to pH < 2 ^{3/}	6 months
Total mercury	7470	250 mL plastic	Cool to 4°C ± 2°C	28 days

^{1/} Actual number, type, and size of container will be coordinated with the laboratory performing the analyses.

^{2/} For samples requiring matrix spike/matrix spike duplicate analysis, triple the number of containers specified above.

^{3/} The samples for dissolved metals will be filtered in the field with a 0.45-micron filter and then preserved with HNO₃ to pH < 2.

APPENDIX C

FIELD PROCEDURES

FIELD PROCEDURES

Field Procedure 1	Mobilization and Demobilization
Field Procedure 2	Water Level Measurement
Field Procedure 3	Groundwater Sampling [NAPL Investigation and Sampling]
Field Procedure 4	Groundwater Sampling [Field Parameter Measurement]
Field Procedure 5	Groundwater Sampling [Low-Flow Purge Procedure]
Field Procedure 6	Decontamination [Field Instrumentation—Probe, Water Quality Meter, etc.]
Field Procedure 7	Decontamination [Low-Flow Groundwater Sampling Equipment]
Field Procedure 8	Well Installation
Field Procedure 9	Sample Packing and Shipment
Field Procedure 10	Site Logbook

FIELD PROCEDURE 1

MOBILIZATION AND DEMOBILIZATION

This field investigation activity consists of field personnel orientation, equipment mobilization, the determination of sampling locations, and demobilization. Each field team member will attend an on-site orientation meeting to become familiar with the history of the site, health and safety requirements, and field investigation procedures.

Equipment mobilization will entail the ordering, purchase, and, if necessary, fabrication of all sampling supplies and equipment needed for the field investigation. An inventory of available SES-TECH supplies/equipment will be conducted prior to initiating field activities, and all additional equipment required will be secured. A field office trailer will be set up and necessary utility hookups will be made as part of the mobilization effort.

Equipment and personnel will be demobilized at the completion of each phase of field activities as necessary. Equipment demobilization may include (but will not be limited to) sampling equipment, drilling subcontractor equipment, and field office trailer and utility hookups. Demobilization will also consist of site area cleanup, staging and inventory of investigation-derived wastes, and organization of investigation records.

FIELD PROCEDURE 2

WATER LEVEL MEASUREMENT

Static water level measurements will be taken in all installed monitoring wells and piezometers (as applicable) prior to each groundwater sampling event. A corresponding surface water elevation measurement will also be conducted prior to each groundwater sampling event. Additional rounds of measurements may be collected throughout the field activities under the direction of the Field Operations Lead or Site Geologist.

Water level measurements will be conducted in accordance with the following procedures:

1. Groundwater level measurements will be collected from all monitoring wells primarily using an electronic water level indicator. An interface probe will also be used during the initial measurement round and periodically throughout the program to check for the presence of free product. Water levels will be measured, relative to surveyed datum (i.e., top of well riser), at a specific mark on the casing, to the nearest 0.01 foot.
2. Electronic water level indicators will preferably be the type with water level markings on the cable at increments of 0.01 foot or less.
3. All electronic water level measurements will be recorded in the appropriate field logbook or data sheet.
4. The electronics of the water level indicator will be checked prior to the commencement of measurements with a jar of water and the depths calibrated on the ground against a steel tape.

The water level indicator cable, tape, and probe will be decontaminated between wells by rinsing with deionized water.

FIELD PROCEDURE 3

GROUNDWATER SAMPLING

[NAPL INVESTIGATION AND SAMPLING]

The presence of free product will be investigated prior to groundwater sampling. An interface probe will be dropped through the water column in each monitoring well to check for the presence of non-aqueous phase liquids (NAPLs) prior to purging. If significant quantities of light NAPL (LNAPL) are encountered in any monitoring well, a clear dual-valve Teflon bailer will be inserted into the well. The product thickness indicated using the interface probe will be verified with the thickness observed within the bailer. A sample of the NAPL should be collected, and then the pump installed in the well.

1. Check and record the condition of the well for any damage or evidence of tampering.
2. Remove the well cap.
3. Measure well headspace with a photoionization detector (PID) or flame ionization detector (FID) and record the reading in the field logbook.
4. Measure NAPL thickness using an oil/water interface probe. Record the NAPL depth and water depth in the logbook.
5. Collect the NAPL sample by slowly lowering a double-check valve bailer into the well in a controlled manner (i.e., with minimal disturbance) to the appropriate depth. After collecting the sample, carefully lift the bailer and pour the liquid into the sample container.
6. Record a description of the product and the procedures in the logbook.
7. Complete sample log, labels, custody seals and chain-of-custody forms. Record in the field notebook. Place analytical samples in a cooler for shipment and chill to 4 degrees Celsius (°C).

FIELD PROCEDURE 4
GROUNDWATER SAMPLING
[FIELD PARAMETER MEASUREMENT]

Field parameters (temperature, pH, turbidity, Eh, specific conductance, and/or dissolved oxygen) will be monitored during purging of the monitoring wells and prior to surface water sampling, utilizing a Horiba® water quality meter or equivalent. Measurements will be conducted in accordance with the manufacturer's instructions and the following procedures:

1. Calibrate the water quality meter according to the manufacturer's instructions.
2. For low-flow purging of the monitoring wells:

Attach a flow-through cell to the polyethylene tubing. Position the water quality meter probe in the flow-through cell. Begin purging the monitoring well.

After the cell has been "flushed" at least twice, begin monitoring the field parameters, and continue approximately every 3 to 5 minutes during purging. All water quality measurements will be recorded in the appropriate field logbook or on a well purge data sheet.

When the indicator parameters have stabilized for three consecutive readings, the well is considered stabilized and ready for sample collection. Remove the flow-through cell from the tubing.
3. For surface water sampling, position the probe directly in the waterbody. All water quality measurements will be recorded in the appropriate field logbook.
4. The probe of the water quality meter will be decontaminated between wells by rinsing with deionized water.

FIELD PROCEDURE 5

GROUNDWATER SAMPLING [LOW-FLOW PURGE PROCEDURE]

Groundwater samples will be collected from monitoring wells installed at the site.

Groundwater samples will be obtained starting at the least contaminated well and proceeding systematically to the well likely to be most contaminated (based on previously collected data). All monitoring well samples will be analyzed as discussed in the LTM/O Plan.

1. Check and record the condition of the well for any damage or evidence of tampering.
2. Remove the well cap.
3. Measure well headspace with a PID or FID and record the reading in the field logbook.
4. Measure and record the depth to water and record the measurement in the field logbook. Do not measure the depth to the bottom of the well at this time (to avoid disturbing any sediment that may have accumulated).
5. Lay out plastic sheeting and place the monitoring, purging, and sampling equipment on the sheeting. To avoid cross-contamination, do not let any downhole equipment touch the ground.
6. Re-check and record the depth to water after approximately 5 minutes at the well location. If the measurement has changed more than 0.01 foot, check and record the measurement again, then begin well purging.
7. Attach and secure the polyethylene tubing to the low-flow submersible pump. As the pump is slowly lowered into the well, secure the safety drop cable, tubing, and electrical lines to each other using nylon stay-ties placed approximately 5 feet apart.
8. Set the pump at approximately the middle of the screen and/or the best depth based on the stratigraphy of the well. Be careful not to place the pump intake less than 2 feet above the bottom of the well because this may cause mobilization of any sediment present in the bottom of the well. Start pumping the well at 0.2 to 0.5 liters per minute.

GROUNDWATER SAMPLING [LOW-FLOW PURGE PROCEDURE] (CONT'D)

9. Monitor the water level in the well periodically during pumping, and ideally the pump rate should equal the well recharge rate with little or no water level drawdown in the well (drawdown shall be 0.3 foot or less). There should be at least 1 foot of water over the pump intake so there is no risk of the pump suction being broken, or entrapment of air in the sample. Record the pumping rate adjustments and depth(s) to water in the logbook. Pumping rates should, if needed, be reduced to the minimum capabilities of the pump (0.1 to 0.2 liters per minute) to avoid purging the well dry. However, if the recharge rate of the well is very low and the well is purged dry, then wait until the well has recharged to a sufficient level and collect the appropriate volume of sample with the submersible pump.
10. Purge the well at a low-flow rate (from 0.2 to 0.5 liters per minute). During purging, monitor the field parameters (temperature, pH, turbidity, Eh, specific conductance, and dissolved oxygen) approximately every 3 to 5 minutes. A flow-through cell will be used to monitor the field parameters. Begin measuring field parameters after the flow-through cell has been “flushed” with groundwater twice.
11. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings, as follows:
 - for pH
 - 3 percent for specific conductance
 - 10 percent for dissolved oxygen
 - 10 percent for turbidity
 - 10 mV for Eh

Dissolved oxygen and turbidity usually require the longest time to achieve stabilization. The pump must not be removed from the well between purging and sampling.

12. Once the field parameters have stabilized, collect the samples directly from the end of the tubing. Volatiles and analyses that degrade by aeration must be collected first. The bottles should be preserved and filled according to the procedures specified in the Quality Control Plan (SES-TECH 2005c).

GROUNDWATER SAMPLING [LOW-FLOW PURGE PROCEDURE] (CONT'D)

13. Fill all sample bottles by allowing the pump discharge to flow gently down the inside of the bottle with minimal turbulence. Cap each bottle as it is filled.
14. Preserve and label the samples, and record them on the chain-of-custody form. Place immediately into a cooler for shipment and maintain at 4°C.
15. The filling and preservation procedures are as follows:
 - Volatile Organic Compounds (VOCs)—Fill each container with sample to just overflowing so that no air bubbles are entrapped inside.
 - Other Parameters—Fill each container and preserve immediately as required.
16. Carefully remove the pump assembly from the well. The tubing will be dedicated to each well. The tubing should be placed in a large plastic garbage bag, sealed, and labeled with the appropriate well identification number.
17. After sampling is complete, measure the total depth of the well.
18. Close and lock the well.

FIELD PROCEDURE 6

DECONTAMINATION [FIELD INSTRUMENTATION—PROBES, WATER QUALITY METERS, ETC.]

Field instrumentation (such as interface probes, water quality meters, etc.) will be decontaminated between sample locations by rinsing with deionized water. If visible contamination still exists on the equipment after the rinse, an Alconox detergent scrub will be added, and the probe thoroughly rinsed again.

Decontamination of sampling equipment will be kept to a minimum in the field and wherever possible, dedicated disposable sampling equipment will be used. Any decontamination fluids generated will be stored in U.S. Department of Transportation (DOT)-approved 55-gallon drums or in an on-site storage tank (liquids only) until disposal. Personnel directly involved in equipment decontamination will wear appropriate protective clothing, as stated in the Site Health and Safety Plan (SES-TECH 2005a).

FIELD PROCEDURE 7

DECONTAMINATION

[LOW-FLOW GROUNDWATER SAMPLING EQUIPMENT]

The following decontamination procedures will be performed for the low-flow purge and sampling procedures.

Non-disposable sampling equipment, including the pump, support cable, and electrical wires in contact with the sample, must be decontaminated thoroughly each day before use (“daily decon”) and after each well is sampled (“between-well decon”). For pumps, it is strongly recommended that non-disposable sampling equipment, including the pump, support cable, and electrical wires in contact with the sample, be decontaminated thoroughly each day before use (“daily decon”). All non-dedicated sampling equipment (pumps, tubing, etc.) must be decontaminated after each well is sampled (“between-well decon,” see below).

Daily Decon

1. Pre-rinse: Operate pump in a deep basin containing 8 to 10 gallons of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.
2. Wash: Operate pump in a deep basin containing 8 to 10 gallons of a non-phosphate detergent solution, such as Alconox, for 5 minutes and flush other equipment with fresh detergent solution for 5 minutes. Use the detergent sparingly.
3. Rinse: Operate pump in a deep basin of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.
4. Disassemble pump.
5. Wash pump parts: Place the disassembled parts of the pump into a deep basin containing 8 to 10 gallons of non-phosphate detergent solution. Scrub all pump parts with a test tube brush.
6. Rinse pump parts with potable water.
7. Rinse the following pump parts with distilled/deionized water: inlet screen, shaft, suction interconnector, motor lead assembly, and stator housing.

DECONTAMINATION [LOW-FLOW GROUNDWATER SAMPLING EQUIPMENT] (CONT'D)

8. Place impeller assembly in a large glass beaker and rinse with 1 percent nitric acid (HNO_3).
9. Rinse impeller assembly with potable water.
10. Place impeller assembly in a large glass beaker and rinse with isopropanol.
11. Rinse impeller assembly with distilled/deionized water.

Between-Well Decon

1. Pre-rinse: Operate pump in a deep basin containing 8 to 10 gallons of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.
2. Wash: Operate pump in a deep basin containing 8 to 10 gallons of a non-phosphate detergent solution, such as Alconox, for 5 minutes and flush other equipment with fresh detergent solution for 5 minutes. Use the detergent sparingly.
3. Rinse: Operate pump in a deep basin of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.
4. Final Rinse: Operate pump in a deep basin containing 1 to 2 gallons of distilled/deionized water, as final rinse.

Decontamination of sampling equipment will be kept to a minimum in the field and, wherever possible, dedicated disposable sampling equipment will be used.

Decontamination fluids will be stored in DOT-approved 55-gallon drums or in an on-site storage tank (liquids only) until disposal. Personnel directly involved in equipment decontamination will wear appropriate protective clothing, as stated in the Site Health and Safety Plan (SES-TECH 2005a).

FIELD PROCEDURE 8

WELL INSTALLATION

Required Equipment

- Field Sampling Plan
- Field logbook, boring log forms, and as-built forms
- Indelible black-ink pens and markers
- Camera
- Drill rig (hollow-stem auger or air rotary)
- Tremie pipe
- Weighted tape or tag-line
- Electronic water sounding tape
- Assorted tools (shovels, wrenches, etc.)
- Annular materials including silica sand, bentonite pellets and chips, and bentonite grout
- Monitoring well materials including flush-threaded, 2-inch diameter, Schedule 40 polyvinyl chloride (PVC) riser pipe, 010 PVC well screen, and end caps in accordance with 173-160 Washington Administrative Code (WAC).
- Completion materials including steel monuments, protective posts (bollards), concrete mix, 2-inch by 6-inch concrete forms (suggested).
- Pump
- Decontamination equipment

Typical Procedures

Note: Monitoring well installation will comply with Minimum Standards for Construction and Maintenance of Wells, 173-162 WAC. The driller will submit a start card and pay the well permit.

Installation:

1. Confirm site access, clear underground utilities, and provide traffic control, as needed.

WELL INSTALLATION (CONT'D)

2. Advance borehole to appropriate depth with observations and measurements recorded on the Boring Log form.
3. Remove the center plug (if present) and rods from the borehole. Depth measurements will be taken during the installation procedure and verified by the rig geologist. Record installation measurements and materials used on the Well Completion form and in the field logbook and in the Monitoring Well Log by the driller.
4. Backfill from bottom of boring to bottom of screen interval with annular materials representative of formation materials.
5. Lower the decontaminated well casing string into the borehole through the hollow-stem augers. Screen size will be determined by the site geologist.
6. Install the silica sand filter pack from 6 inches below the screen to a minimum of 3 feet above the screen. Use a tremie pipe, if possible, to install the filter pack. Filter pack sand size will be determined on site by the Site Geologist.
7. Install a bentonite chip or pellet plug (2-foot minimum) above the filter pack. If below the water table, use a tremie pipe to install the plug, if possible. If the tremie cannot be used due to bridging, then slowly gravity-feed the pellets.
8. Install a bentonite chip or bentonite grout seal from the top of the bentonite plug to the frost line (approximately 6 inches below grade). Hydrate the bentonite chips with potable water prior to placement of the annular seal to prevent grout infiltration into the filter pack.
9. Cut PVC riser (for surface completions). Record cut length in field logbook.
10. Attach a lockable cap to the top of the casing. Install a protective cover, level with the ground surface, with a waterproof seal to prevent the inflow of surface water.
11. The well identification number is the start card number, which is stamped or engraved on the outer well casing or permanent protective well cover.

WELL INSTALLATION (CONT'D)

Well Development

1. Calibrate field instrumentation for measurement of water parameters including pH, specific conductance, dissolved oxygen, temperature, and turbidity temperature, pH, and conductance.
2. Begin development of well by pumping and surging or by bailing.
3. Record parameter data and approximate volumes of water produced on well development form.
4. Continue development of well until discharge is clear and parameters have stabilized (temperature, dissolved oxygen, and specific conductance within ± 10 percent, pH within ± 0.5 units).
5. Remove development equipment and clean up site.
6. Decontaminate all equipment.
7. Transport water for characterization/disposal if being contained.
8. Document activities in the field and site logbooks.

FIELD PROCEDURE 9

SAMPLE PACKING AND SHIPMENT

Required Equipment

- Sampling and Analysis Plan
- Indelible black ink pens
- Field logbook
- Ziploc[®] bags
- Coolers
- Blue Ice[®] (or equivalent)
- Strapping tape or duct tape
- Vermiculite (or equivalent)
- Garbage bags
- Sample logs
- Sample labels
- Chain-of-custody forms
- Custody seals

Typical Procedures

Note: Before packing, all samples will be individually labeled and noted in the field logbook by the Sample Coordinator or designee. Labels will be completed with all required information. The samples will be assigned individual numbers. The sample numbers will be used to complete the chain-of-custody forms.

SAMPLES TO BE HAND-DELIVERED TO THE LABORATORY:

- Attach sampling label and custody seals (if necessary) on each sample jar.
- Place each sample in a plastic Ziploc[®] bag and align the label so it can be easily read. Seal the bag.
- Place individual samples into the cooler lined with a larger heavy-duty garbage bag so that each container is safely secured.

SAMPLE PACKING AND SHIPMENT (CONT'D)

- Include three or more (sufficient) Blue Ice[®] packs (or equivalent) to maintain a low temperature environment (approximately 4°C or less). Blue Ice[®] packs should not be in contact with the sample containers.
- Complete a chain-of-custody form for the containers and seal in a plastic Ziploc[®] bag. Place the chain-of-custody form in the cooler. Always transport the cooler with its accompanying chain-of-custody form together.

SAMPLES TO BE SHIPPED TO THE LABORATORY:

- Place each sample in a plastic Ziploc[®] bag and align the label so it can be easily read. Seal the bag.
- Place individual samples into the cooler so that each container has some clearance on all sides.
- Cover the headspace inside the cooler with frozen Blue Ice[®] packs (or equivalent).
- Place the chain-of-custody form in a sealed plastic Ziploc[®] bag and place in the cooler.
- Close and latch the cooler. Wrap the cooler and lid with at least two turns of strapping or duct tape. Affix signed custody seals over the edge of the lid and the top of the cooler body at front and rear.
- Label coolers with up arrows and information to comply with DOT requirements.

The Field Operations Lead will notify the laboratory of approximately when and how many samples will arrive. The samples must be kept under refrigeration (or packed with Blue Ice[®] or equivalent) between sampling and analysis processing. The sample containers will be checked on arrival at the laboratory for breakage.

FIELD PROCEDURE 10

SITE LOGBOOK

Purpose

This guideline describes the process for keeping a site logbook.

Scope

The site logbook is a controlled document that records all major on-site activities during this cleanup action. At a minimum, the following activities/events should be recorded in the site logbook:

- Arrival/departure of site visitors,
- Arrival/departure of major site equipment (e.g., bobcat, mini-excavator),
- Sample and waste shipment information (shipping manifests, chain-of-custody form numbers, carrier, air bill numbers, time),
- A summary of activities and logsheet numbers,
- Start or completion time of individual activities, and
- Health and safety issues (e.g., level of protection, occurrence of incidents).

The site logbook is initiated at the start of the first on-site activity. Entries are made each day that on-site activities take place involving remediation contractor personnel.

The site logbook becomes part of the permanent Task Order (TO) file maintained in the remediation contractor's office. Because information contained in the site logbook may be admitted as evidence in legal proceedings, it is critical that this document be properly maintained.

Definitions

Site Logbook—The logbook is a bound notebook with consecutively numbered pages that cannot be removed. Upon entry of data, the logbook requires signature by the responsible site leader.

Responsibilities

The site logbook is issued by the Task Order Manager (TOM) (or his/her designee) to the Site Superintendent/Field Sampling Lead for the duration of the project. The Site Superintendent/Field Sampling Lead releases the site logbook to the other person

SITE LOGBOOK (CONT'D)

responsible for the direction of on-site activities. It is the responsibility of this person (or designee) to keep the site logbook current while in his or her possession, and return it to the Site Superintendent/Field Sampling Lead or turn it over to another field team. Following the completion of all fieldwork, the site logbook is returned to the TOM for inclusion in the permanent TO files.

Guidelines

The cover of each site logbook shall contain the following information:

- Project name and Navy TO number
- SES-TECH charge number
- Site personnel names
- Sequential book number
- Start date
- End date

Daily entries into the logbook may contain a variety of information. At the beginning of each day, the following information must be recorded:

- Date
- Start time
- Weather conditions
- All field personnel present
- Any visitors present

During the day, a summary of all site activities and level of personal protective equipment (PPE) should be recorded in the logbook. The information need not duplicate anything recorded in other field notebooks (e.g., sample logbook, Site Health and Safety Specialist's notebook, calibration logbook, etc.), but should summarize the contents of the other notebooks and refer to the page locations in these notebooks for detailed information.

The sample logsheet for any sample(s) collected must be referenced. If measurements are made at any location, the measurements and equipment used must either be recorded in the site logbook or reference must be made to the notebook and page number(s) on which they are recorded. All maintenance and calibration records for equipment should be traceable

SITE LOGBOOK (CONT'D)

through field records to the person using the instrument and to the specific piece of instrumentation itself.

All entries should be made in waterproof black pen. No erasures are permitted. If an incorrect entry is made, the data should be crossed out with a single strike mark, initialed, and dated. At the completion of entries by any individual, the logbook must be signed. It must also be signed by the Site Superintendent/Field Sampling Lead or responsible site leader at the end of each day.

Photographs:

The record of photographs taken at a site for the purpose of project documentation must be recorded in the site logbook or a field notebook. When movies, slides, or photographs are taken of a site or any monitoring location, they are numbered to correspond to logbook entries. The name of the photographer, date, time, site location, site description, and weather conditions must be entered in the logbook as the photographs are taken. A series entry may be used for rapid-sequence photographs. The photographer is not required to record the aperture settings and shutter speeds for photographs taken within the normal automatic exposure range. However, special lenses, films, filters, and other image-enhancement techniques must be noted in the logbook. If possible, such techniques should be avoided because they can adversely affect the admissibility of photographs as evidence. Chain-of-custody procedures depend upon the subject matter, type of film, and the processing methods. Film used for aerial photography, confidential information, or criminal investigations require chain-of-custody procedures. Adequate logbook notations and receipts may be used to account for routine film processing. Once processed, the slides of photographic prints shall be serially numbered and labeled according to the logbook descriptions.

APPENDIX D

BNC WASTE MANAGEMENT

BNC WASTE MANAGEMENT

WASTE DESIGNATION PROCEDURE

BNC Resource Conservation and Recovery Act (RCRA) Permit (NAVSHIPYDPUGETINST P5090.5D [HWMP])

In accordance with Bremerton naval complex (BNC) procedures, all waste streams must be designated using a Waste Information Sheet (WIS). SES-TECH personnel completing the WIS must be familiar with the Contractor's Guide to Hazardous Waste Compliance (NAVSHIPYDPUGET P5090[5]). All WISs must be submitted to the BNC through the Contracting Officer (KO) for processing and approval by Shop 90HM for review and waste designation.

Procedures for Waste Area Designation (WAD) must be followed while the waste stream is being designated. Most waste streams (i.e., wastes that will not require sampling and analysis) will be pre-designated prior to the start of the project with the WIS process. For waste streams that require sampling and analysis, a Sampling and Analysis Plan (SAP) will be submitted to the KO for review and approval by Shop 90HM before any sampling activities are conducted. No sampling will be conducted until approval has been obtained through the KO.

With the submittal of the WIS, the various disposal facilities for solid waste, recycling, and dangerous waste, plus the transporter(s), must be specified. Once the WIS is approved and the waste is designated by Shop 90HM, neither the facilities nor the transporters can be changed without a change to the WIS. All transporters of hazardous waste to be used in the process must be identified on the WIS. All Treatment, Storage, and Disposal Facilities (TSDFs) and transporters of hazardous waste must be on the Navy Defense Reutilization and Marketing Service (DRMS) qualified list. TSDF and transporters of non-hazardous waste must be approved by the KO in conjunction with Shop 90HM. In addition, the facilities and transporters will be reviewed and approved by SES-TECH for use on this project.

WASTE STREAMS AND CHARACTERIZATION

Washington Dangerous Waste Regulations (Washington Administrative Code [WAC]) 173-303)
BNC Hazardous Waste Management Plan (HWMP)
BNC RCRA Permit (NAVSHIPYDPUGETINST P5090.5D HWMP)
Minimal Functional Standards for Solid Waste Handling (WAC 173-304)
BNC Contractor's Guide to Environmental Compliance [NAVSHIPYDPUGET P5090(5)]
RCRA Hazardous Waste Identification (40 Code of Federal Regulations [CFR] 261)
BNC Water Pollution Prevention and Control Plan (NAVSHIPYDPUGETINST P5090.30A)

The following waste streams are currently anticipated for Task Order (TO) 1. If additional waste streams are identified for the LTM/O actions, they will be added to this plan via the Field Change Request (FCR) process. The FCR process is discussed in the Site Work Plan. The FCR is part of the SES-TECH QC process for implementing and tracking changes as a result of site conditions and ensuring appropriate reviews and approvals have been obtained prior to implementation.

- 1) **Wastewater** – All wastewater, including decontamination (decon) water, will be containerized in portable tanks and/or drums, stored in a registered accumulation area, and designated under the WIS procedure. The wastewater will be stored as a WAD pending designation by Shop 90HM. Procedures for WAD storage are provided below. Secondary containment will be provided. All wastewater will be disposed of in accordance with the analytical results and the designated WIS.

If appropriate, based on the sampling and analysis and the designated WIS, the wastewater will be proposed for disposal in the sanitary sewer system. Discharge to the sewer system will not be conducted until the WIS has been designated by Shop 90HM and approval has been obtained from the BNC.

If the analytical results indicate that the wastewater is a Hazardous/Dangerous Waste, the wastewater will be handled, stored, and disposed of in accordance with the BNC and regulatory requirements.

- 2) **Personal Protective Equipment (PPE)** – PPE will be re-used where possible and be stored and disposed of according to the designated WIS by Shop 90HM. If PPE is generated prior to waste designation, the PPE will be stored in a 55-gallon drum with the waste stream and be stored as WAD.
- 3) **Common Trash** – Common trash as defined by the BNC will be disposed in a SES-TECH-provided dumpster upon receipt of the approved WIS. The trash dumpster will not have an open drain and will be covered to prevent stormwater

accumulation. The list of common trash will be reviewed with project personnel at the start of the project.

NON-HAZARDOUS WASTE - TRANSPORT SOLID WASTE TRACKING SHEETS (SWTS)

Minimal Functional Standards for Solid Waste Handling (WAC 173-304)

Profiles/Certification Sheets – If profiles/certification sheets are required for non-hazardous waste, forward these with the WIS (or shortly thereafter) to the KO for submittal to Shop 90HM.

Solid Waste Tracking Sheets – All waste that is not designated hazardous or dangerous, PCBs, or asbestos, including recycled waste (i.e., metal) and reused material (i.e., oil), will be tracked using the Contractor's Solid Waste Tracking Sheets (SWTSs). By the fifth of the following month, a Contractor's Monthly Project Waste Summary Report must be submitted to the KO, who will submit the completed document to the Solid Waste Program Manager. The contractor, all transporters, and disposer/recycler must sign the SWTS.

HAZARDOUS WASTE/DANGEROUS WASTE AND WAD CONTAINER MANAGEMENT

Washington Dangerous Waste Regulations (WAC 173-303)
Hazardous Materials Transportation Act and Regulations (49 CFR 171-180)
Minimal Functional Standards for Solid Waste Handling (WAC 173-304)
BNC RCRA Permit (NAVSHIPYD PUGET P5090.5D [HWMP])
BNC Contractor's Guide to Environmental Compliance [NAVSHIPYDPUGET P5090(4)]
BNC Contractor's Guide to Hazardous Waste Compliance [NAVSHIPYDPUGET P5090(5)]

Container Selection – Containers will be:

- Inspected before use to ensure that they are in good condition.
- Evaluated before use to determine if the container is compatible with the waste. Incompatible containers will not be used.

- U.S. Department of Transportation (DOT)-approved (e.g., United Nations [UN] specified drums or roll-off boxes).
- Verified to be properly rated for weight of waste to be contained.

Container Management – Containers will be:

- Inspected weekly while in use to ensure that they are in good condition. If not in good condition, the waste will be immediately transferred to a compatible container in good condition.
- Closed at all times, except when waste is being added or removed.
- Reused only for the same waste stream (same Waste Stream Number [WSN]), except uncontaminated overpack containers.
- Positioned so that labels are clearly visible.
- Stored so that a minimum of 30-inches aisle space is maintained between each row of containers. A row of drums will not be more than two drums wide.
- Incompatible wastes will be segregated from each other. Incompatible wastes will not be placed in the same container.
- Containers will be stored within containment systems. Incompatible waste will have separate containment systems.

Secondary Containment – Required when accumulating:

- Liquid hazardous waste within 50 feet of a storm drain
- Flammable liquid or reactive waste
- All waste in a 90-day accumulation area (see section entitled “Hazardous/Dangerous Waste Management (90-Day Accumulation Area) – Accumulation”)
- Other hazardous waste per Code 106 determination
- All drums must be placed fully within secondary containment and protected from rain. A covered containment must hold the greater of 10 percent of the volume of all containers or the volume of the largest container. An uncovered area also has to have the capacity to hold 4 inches of rainfall in addition to holding the greater of 10 percent of the volume of all containers or the volume of the largest container.

Waste Segregation – Segregate all wastes according to the source to prevent cross-contamination. Waste can be segregated by placing in any of the following:

- Roll-off box, drums, or stockpile for soil (as per Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA])
- Drums and/or portable tanks for decontamination

- Containers of WAD or dangerous waste will be held in a Navy-approved accumulation area as described in the WAD accumulation section.

Marking and Labeling – Container labeling will be specified on the completed WIS. All labels will be supplied by the BNC. All containers will have an identification (ID) label. All designated dangerous/hazardous waste will have the following labels applied to the containers:

- ID Label
- Hazardous Waste Label
- DOT Labels (as specified on the WIS)
- Accumulation start date

Inventory and Tracking (applies to 90-day accumulation areas only) – Log each container onto an inventory sheet that will be maintained by the SES-TECH Waste Coordinator. Forward inventory records to the KO for submittal to Code N3212 by the first of each month unless this requirement is waived. The inventory will include the following:

- Originator's name
- Waste description and WSN
- Type and quantity of waste containers
- Accumulation start date
- Date received and shipped from accumulation area

WASTE AWAITING DESIGNATION MANAGEMENT – ACCUMULATION

Washington Dangerous Waste Regulations (WAC 173-303)
BNC Contractor's Guide to Environmental Compliance [NAVSHIPYDPUGET P5090(4)]
BNC Contractor's Guide to Hazardous Waste Compliance [NAVSHIPYDPUGET P5090(5)]
BNC RCRA Permit (HWMP NAVSHIPYDPUGET P5090.5D)

WAD will be containerized and held in the SES-TECH registered satellite accumulation area (SAA) prior to the end of the work shift. A WIS will be submitted to the KO for Navy designation within one working day after the waste has been produced. Once designation of the waste has been received, additional labels and management of the WAD will occur as dictated by the designation on the WIS.

Containers will be:

- In good condition and non-leaking.
- Compatible with waste being placed in them.
- Closed at all times, except when waste is being added.
- Labeled with an ID label and include the word “WAD.”
- Positioned containers so the ID label is visible for inspection.
- Physically segregated from containers of designated hazardous waste.
- Kept in the original SAA it was placed in.

SATELLITE ACCUMULATION AREA – ACCUMULATION

Washington Dangerous Waste Regulations (WAC 173-303)
BNC RCRA Permit (HWMP NAVSHIPYDPUGET P5090.5D)
RCRA 40 CFR 260-268

The following procedures apply in the event an SAA is needed.

- Establish an SAA by submitting a Contractor Request for HW SAA Registration through the KO.
- Use the area only for storage of waste and not for storing non-related materials, equipment, or functions.
- Follow all container requirements specified above. The container must be labeled with an ID label, hazardous waste label, or Washington Dangerous Waste Label (WSW), applicable DOT label, and any additional labels specified on the WIS. ID labels must be filled in completely. Hazardous waste (HW) labels must be clearly visible. All labels should be on the upper one-third of the container where practicable.
- Post the emergency spill response procedures and have a spill kit nearby.
- Keep a fire extinguisher and telephone (cellular phone) near the area as a precaution.
- Make an emergency shower/eyewash station immediately available, tested weekly, and kept functioning.

- Ensure that the SAA is secured as part of securing the site to prevent improper mixing or unauthorized addition of waste to the containers.
- Conduct regular inspections using SAA Inspection Logs. Keep a logbook that includes the date, time, findings, actions taken, and inspector's signature.
- Post "HAZARDOUS WASTE ACCUMULATION AREA" signs so they are visible from a distance of 25 feet.
- When 55 gallons or more of an HW stream is present in the SAA, the start date must be filled in on the HW or WSW label and all waste of that particular waste stream must be transferred to a 90-day Accumulation Area or shipped off site to the TSDF within 3 days from the start date.
- Remove or decontaminate all containers, liners, and waste prior to closure. Arrange a closeout inspection with the KO.

Secondary containment requirements for an SAA will be implemented as follows:

- Satellite accumulation over water, such as on piers and dry docks are required to be attended by an Accumulation Area Operator (AAO).
- All flammable and Extremely Hazardous Wastes (EHW) (WAC 173-303) will have separate impermeable secondary containment.
- Secondary containment will be provided for all transfers of liquid EHWs from one container to another and for all liquid dangerous waste accumulated within 15 meters (50 feet) of a storm drain.

HAZARDOUS/DANGEROUS WASTE MANAGEMENT (90-DAY ACCUMULATION AREA) – ACCUMULATION

Washington Dangerous Waste Regulations (WAC 173-303)
BNC RCRA Permit (NAVSHIPYDPUGET P5090.5D)
BNC Contractor's Guide to Environmental Compliance [NAVYSHIPYDPUGET P5090(4)]
BNC Contractor's Guide to Hazardous Waste Compliance [NAVYSHIPYDPUGET P5090(5)]
RCRA 40 CFR 260-268

The following procedures apply in the event a waste is characterized as hazardous/dangerous waste by Shop 90HM.

- Establish a 90-day accumulation area by submitting a Contractor Request for 90-day HW Accumulation Area Certification/Recertification form through the KO.
- Use the area only for storage of waste and not for storing non-related materials, equipment, or functions.
- Follow all container requirements specified above.
- Post the emergency spill response procedures and have a spill kit in the area.
- Keep a fire extinguisher, water supply, telephone, and alarm at the area.
- Make an emergency shower/eyewash station immediately available, tested weekly, and kept functioning.
- Lock the gate to the accumulation area when authorized personnel are not present.
- Provide secondary containment, unless this requirement is waived by Code 106.
- Post “HAZARDOUS WASTE ACCUMULATION AREA” and “DANGER – UNAUTHORIZED PERSONNEL KEEP OUT” signs at the entrance.
- Conduct inspections every 7 days using 90-Day Weekly Inspection Logs. Forward copies of these inspections to the KO for submittal to Code 106 at the end of every month. Keep a logbook that includes the date, time, findings, actions taken, and inspector’s signature.
- Post “NO SMOKING OR OPEN FLAME” signs unless waived.
- Remove or decontaminate all containers, liners, and soil prior to closure. Arrange a closeout inspection with the KO.

NON-HAZARDOUS WASTE MANAGEMENT AND IDW– ACCUMULATION

Minimal Functional Standards for Solid Waste Handling (WAC 173-304)
Bremerton Kitsap County Board of Health, Ordinance Number 2000-6 Solid Waste
Regulations

Waste that is designated non-hazardous or IDW will be:

- Stored in a designated non-hazardous storage area.
- Marked with the contents of the container as instructed by the approved WIS. IDW drums will be marked 'IDW' until appropriately designated.
- Disposed of at the designated facility on the WIS.

DANGEROUS/HAZARDOUS WASTE MANAGEMENT – MANIFESTS

Washington Dangerous Waste Regulations (WAC 173-303)
BNC Contractor's Guide to Hazardous Waste Compliance [NAVYSHIPYDPUGET P5090(5)]
RCRA 40 CFR 260-268

The following procedures apply in the event a waste is designated as hazardous/dangerous waste by Shop 90HM.

- **TSDF** – Only TSDFs that are approved by the KO in conjunction with BNC Shop 90HM and SES-TECH and are on the DRMS list will be used for the treatment and/or disposal of dangerous/hazardous waste. The approved TSDFs will be provided on the WIS.
- **Profiles** – Prepare profile sheets provided by the TSDF. Submit the profile sheets with the WIS sheets 20 working days (minimum) before removal off site.
- **Manifests** – All shipments of dangerous/hazardous waste must be manifested. BNC personnel will generate and sign all manifests. After the waste has been designated by Shop 90HM and the disposal facility and transporter have been approved, contact the KO (a minimum of 10 working days prior to removal of dangerous/hazardous waste off site) to have the manifest generated. All transporters must have certified tare weights. (Note: If the transporter does not have a certified tare weight, the containers will have to be weighed at the BNC scale house as soon as they arrive at the BNC, before material transfer occurs.) Before allowing the manifested waste to leave, a Navy representative must do the following:
 - Sign the manifest certification by hand;
 - Obtain the handwritten signature of the initial hauler and date of acceptance on the manifest;

- Retain one copy and give one copy (“generator copy”) to the KO (or his designee); and
- Give the “original copy” and remaining copies of the form to the hauler.

The original signed manifest is required by state and federal regulations to be returned to the generator (BNC). If the manifest has not been returned to the BNC within 35 days of the ship date, the BNC (Code 106) will contact the TSDF and/or the transporter(s) to obtain the status of the waste. Any efforts SES-TECH undertakes to obtain status will be recorded and documented (e.g., phonecons) and forwarded to the KO and Shop 90HM. The BNC will prepare and submit an exception report to Washington State Department of Ecology (copy to EPA for hazardous waste containing polychlorinated biphenyls [PCBs]), when the manifest has not been received within 45 days of the ship date.

- If SES-TECH receives the original manifest, they will immediately forward it to the KO and maintain a copy for the project files.
- All project staff involved in hazardous/dangerous waste management will have RCRA Training in accordance with 40 CFR 265.16, WAC 173-303-330 and the PSNS AAO Training.

HAZARDOUS/DANGEROUS WASTE MANAGEMENT – TRANSPORT

Hazardous Materials Transportation Act and Regulations (49 CFR 171-180)
Washington Transportation of Hazardous Materials (WAC 446-50)
Minimal Functional Standards for Solid Waste Handling (WAC 173-304)

Approved Transporters – All transporters for any waste on this project must be approved by the KO, listed on the designated WIS, and reviewed and qualified by SES-TECH. Specific transporters to be used cannot be identified at this time. As part of the WIS process, transporters will be reviewed to ensure that they are on the Navy-approved list and are SES-TECH-qualified. Only approved transporters will be used and will be placed on the WIS. All transporters to be used in the process will be identified on the WIS and, if applicable, on the Manifest or Waste Shipment Record. If a change in the transporter should occur, the WIS will be resubmitted through the KO for review and approval by Shop 90HM.

DOT Requirements – All DOT-related functions must be performed by DOT-trained personnel who will properly classify, describe, package, mark, and label all waste for shipment as required by 49 CFR 171. Check with the Program Environmental Compliance Manager, Keli McKay-Means (360) 598-8108 for DOT-trained personnel.

Shipping Name – Material that does not exhibit one of the nine DOT hazard class characteristics (i.e., explosive, flammable, poison, combustible, etc.) is not regulated under DOT rules for the transportation of hazardous material. If material is suspected to be hazardous, it must be shipped under the suspected hazard class. Each shipment of a suspected hazardous material must be properly classed using the Hazardous Materials Table in 49 CFR 172.101. Marking and labeling requirements are also included in the Hazardous Materials Table.

Marking and Labeling – The shipping name, hazard class, identification number, technical names (if applicable), EPA markings, waste code numbers, and consignee/consignor designations must be marked on packages for shipment (49 CFR 172.301). Once the waste is characterized, reference should be made to the Hazardous Materials Table in 49 CFR 172.101 to determine the appropriate label.

Dangerous/Hazardous Waste – All wastes will be shipped according to DOT requirements.

Placarding – SES-TECH will offer placards (49 CFR 172.506) when required or ensure that the transporter has the appropriate placards prior to leaving the site. If a placard is required, it must be affixed on each side and each end of the vehicle. Specific placard descriptions are found starting at 49 CFR 172.421.

Shipping Papers – The hazardous waste manifest will be utilized as the shipping paper for all dangerous/hazardous waste shipments.

Field Inspection – SES-TECH will assist BNC personnel in checking driver's licenses with a commercial driver's license endorsement and certifications during dangerous/hazardous waste transport by providing an additional inspection prior to vehicle loading. Any drivers without the proper documentation will be asked to fax the document. If the documentation is not provided, the driver's vehicle will not be loaded.

Field Checklist – SES-TECH will review the Scope of Work (SOW) Standard Transporter checklist with the driver prior to the trucker taking custody of the waste and leaving the site. The checklist will be signed by the SES-TECH representative and the truck driver. The signed checklist will be placed in the project files.

PROCEDURES FOR HANDLING REJECTED LOAD OF HAZARDOUS WASTE

RCRA 40 CFR 260-268
Washington Dangerous Waste Regulations (WAC 173-303)

If a load of hazardous waste is rejected from the TSDF facility, immediately notify the Task Order Manager (TOM) (Aaron Vernik at 360-598-8113). **This notification should occur as soon as anyone at the site becomes aware of the load rejection.** The notification must include a contact name and number for someone who is aware of the waste and the reason for rejection. The Task Order Manager (TOM) will immediately notify the Remedial Project Manager (RPM)/KO regarding the rejected load so that the RPM/KO may contact the BNC. The following information should be provided to the RPM/KO:

- Manifest number
- Generator of manifest
- The date of waste rejection
- Who rejected the waste at the TSDF (include contact name/phone numbers)
- The reason for waste rejection
- Where the waste is located
- Whether the TSDF will send the waste back to the generator, and when.

The project-designated waste coordinator will help provide the information. Immediate notification of the RPM/KO should occur even if all the information is not available. However, the information should be easily accessible and transmitted to the RPM/KO as soon as possible. After notification, proceed with the technical direction from Naval Facilities Engineering Command Northwest (NAVFAC NW).

NON-HAZARDOUS AND DANGEROUS WASTE MANAGEMENT – DISPOSAL

Washington Dangerous Waste Regulations (WAC 173-303)
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Off-Site Rule (40 CFR 300.440)
RCRA (40 CFR 260-268)

SES-TECH is responsible for disposal of both non-hazardous and hazardous waste on behalf of the Navy for these contracts. With the submittal of the WIS, SES-TECH will specify the various facilities for solid waste, recycling, and dangerous waste plus the transporters. If the transporter and receiving facility have not already been approved by the BNC, the name, physical address, telephone number, and permit information will be submitted to the KO for review and recommended approval prior to submitting the WIS.

BNC will use the information provided to evaluate each waste stream to ensure that it meets the waste acceptance criteria and packaging requirements for the proposed disposal facility.

SES-TECH Subcontractor Qualification Procedures will be used to determine if the TSDF is operating in a compliant and environmentally responsible manner and if it is a CERCLA off-site-approved facility. These procedures apply to hazardous, non-hazardous, and recycling facilities. For hazardous waste, manifests will be tracked to ensure timely disposal.

Certificate for Disposal (CFD) – Within 10 working days after final disposal of hazardous waste, SES-TECH will request a CFD from the disposal facility for submittal to the KO. The KO will forward the CFD to Shop 90HM. The CFD will include the following:

- Waste profile sheet number
- BNC manifest number and ship date
- Quantity disposed
- All waste disposed
- Disposal facilities (EPA ID number, name, location, and phone number)
- Disposal method
- Date of final disposal
- Signature of person responsible for adequate and appropriate disposition of the waste.

UNANTICIPATED ENCOUNTERED DANGEROUS/HAZARDOUS WASTE

BNC RCRA Permit (HWMP NAVSHIPYDPUGET P5090.5D)
Washington Dangerous Waste Regulations (WAC 173-303)
RCRA 40 CFR 260-268

The following procedures apply when hazardous waste is encountered that is not anticipated and is not part of this project:

- Call Navy emergency response at 360-476-2222 (cellular) or 911 (BNC telephone) if considered a threat to human health and the environment.
- Notify the KO immediately.
- Have the KO make the necessary arrangements with Shop 90HM for the waste to be handled.

APPENDIX E

LOGS FOR WELLS 392 AND 715

Lithologic Log (Soil)						Borehole No. MW-392		Page 1 of 2			
Client <u>U.S. Navy</u>						Project <u>CTO-161</u>		Site <u>OU-NSC</u>			
Location <u>392</u>		Location Type <u>MW</u>		Construction Method <u>HS</u>		Borehole Diameter (Inches) <u>8</u>					
Total Depth (Feet) <u>40'</u>		Ground Elev. (Fl. MSL)		Drilled by (company) <u>Tacoma Pump & Dr. II</u>							
Supervised by (company) <u>URS Consultants</u>						Date Started <u>7-21-94</u>		Date Completed <u>7-21-94</u>			
NOTE: Indicate sample intervals and depths water encountered. <u>9 ft</u>											
Depth (ft)	Sample Number	Sampling Method	Blow Count / 6 in	Recovery (in)	USCS Symbol	Strata	Lithologic Description	LEL	OVM / FID	Particulate	Other (Specify)
							18" concrete				
		H _{ND}			GM		Silty Gravels, sand-silt-gravel mixtures, metal wood, gravel SA-A 1/4-2" F.II	0	0	0	
	21210	H _{ND}			GM		Silty Gravels, sand-silt-gravel mixtures, moist Black, fuel smell, wood, gravel SA 1/4-1/2" OVM - 116.3 PPM F.II	0	0	0	
-5		S	7 11/19	13	GM		Same - moist, black-grey, fuel saturated Gravel SA 1/4-1/2" OVM 536.2 PPM F.II	0	0	0	
		S	5 8/6/5	8	GM		Same as above OVM 2017 PPM F.II	0	0	0	
		S	12 14/14/10	6	GM		Same but wet, Black-grey, almost all gravel OVM > 10,000 PPM F.II	0	0	0	
-10	21211	S	15 17/11/9	10	GM		Same as above, gravel SR-SA 1/8-1/4" OVM > 10,000 PPM F.II	0	0	0	
		S	2 2/4/6		GM		Silty Gravels, sand-silt-gravel mixtures, wet slurry, Black-grey, gravel SR 1/8-1/4" OVM > 10,000 PPM F.II	0	0	0	
-15		S	1 2/10/10	22	GM		Same - Black-grey, wet, gravel SR 1/8-3/4" wood, yellow-red brick OVM 415 PPM F.II	0	0	0	
		S	2 10/12/14	14	GM		Same / no brick OVM 435 PPM F.II	0	0	0	
-20		S	6 16/16/10	8	GM		Same as above OVM 227 PPM F.II	0	0	0	
		S	3 8/8/8	12	GM		Same, wet, Black, gravel SA-SR 1/8-1/2" OVM 726 PPM F.II	0	0	0	
		S	4 8/8/8	13	GM		Same, wet, Black, gravel SA-SR 1/8-1/4" wet, oil OVM 1349 PPM F.II	0	0	0	
-25		S	3 6/9/10	13	GM		Same w/wood, very oily OVM 863 PPM F.II	0	0	0	
		S	3 6/7/8	24	GM		Same, wet, Black, oil gravel SR 1/4-1/2" OVM 948 PPM F.II	0	0	0	
		S	3 16/50-3"	0	GM		No Recovery	0	0	0	
Remarks											

Location Type		Construction Method		Sampling Method	
BH Borehole MW Monitoring Well	AP Air Percussion AR Air Rotary CT Cable Tool	HA Hand Auger HS Hollow Stem Auger RR Reverse Rotary	C Continuous D Drill Cuttings H Hand Auger	L Tube Liner S Split Spoon T Shelby Tube	
Recorded By <u>R. Rose</u>		Checked By		Date	

1021/93

Lithologic Log (Soil)						Borehole No. MW-392		Page 2 of 2												
Client U.S. Navy						Project CTO-161		Site OU-NSC												
Location 392		Location Type MW		Construction Method HS		Borehole Diameter (Inches) 8														
Total Depth (Feet) 40		Ground Elev. (Ft. MSL)		Drilled by (company) Tacoma Pump & Drilling																
Supervised by (company) URS Consultants						Date Started 7-21-94		Date Completed 7-21-94												
NOTE: Indicate sample intervals and depths water encountered. 9 ft																				
Depth (ft)	Sample Number	Sampling Method	Blow Count / 6 in	Recovery (in)	USCS Symbol	Strain	Lithologic Description	LEL	OVM / FID	Particulate	Other (Specify)									
		S	14/24/10	8	GM		Silty Gravels, sand-silt-gravel mixtures, wet, black-grey, oily, wood, gravel SA-SR 1/8-1/4" OVM 210 ppm F.II	0	0	0										
		S	4/4/5/15	9	GM		same as above OVM 200 ppm F.II	0	0	0										
25		S	2/2/3/5	6"	GM		same as above w/increasing sand OVM 200 ppm F.II	0	0	0										
		S	2/1/1/1	7	SM		Silty sands, sand-silt mixtures wet, grey, OVM 100 ppm F.II	0	0	0										
40	21212	S	2/3/3/3	8	SM		Silty sands, sand-silt mixtures wet, grey, abundant shell fragments Native	0	0	0										
Screened between 26-6 ft sand to 4 ft bentonite chip to 1 ft 14 bags of sand 2 bags of bentonite chip																				
Remarks																				
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Location Type</th> <th style="width: 33%;">Construction Method</th> <th style="width: 33%;">Sampling Method</th> </tr> </thead> <tbody> <tr> <td>BH Borehole MW Monitoring Well</td> <td>AP Air Percussion AR Air Rotary CT Cable Tool</td> <td>HA Hand Auger HS Hollow Stem Auger RR Reverse Rotary</td> </tr> <tr> <td></td> <td>C Continuous D Drill Cuttings H Hand Auger</td> <td>L Tube Liner S Split Spoon T Shelby Tube</td> </tr> </tbody> </table>												Location Type	Construction Method	Sampling Method	BH Borehole MW Monitoring Well	AP Air Percussion AR Air Rotary CT Cable Tool	HA Hand Auger HS Hollow Stem Auger RR Reverse Rotary		C Continuous D Drill Cuttings H Hand Auger	L Tube Liner S Split Spoon T Shelby Tube
Location Type	Construction Method	Sampling Method																		
BH Borehole MW Monitoring Well	AP Air Percussion AR Air Rotary CT Cable Tool	HA Hand Auger HS Hollow Stem Auger RR Reverse Rotary																		
	C Continuous D Drill Cuttings H Hand Auger	L Tube Liner S Split Spoon T Shelby Tube																		
Recorded By R. Rose				Checked By				Date												

Well Installation (Flush)				Document Control	Page 1 of 1
Installation I.D. <u>PSNS</u>		CTO Number <u>0661</u>		Site I.D. <u>OU-NSC</u>	
Location I.D. <u>392</u>		Well Owner <u>NAVY</u>		Logging Company <u>URS</u>	
Date Started <u>7-21-99</u>		Date Completed <u>7-21-99</u>		Installing Company <u>TACOMA RMD</u>	
Casing Diameter (In) <u>4"</u>		Borehole Diameter (In) <u>10"</u>		Casing Elevation (FL MSL) <u>~12'</u>	
		Formation of Completion <u>upper Shallow</u>		Screen Zone <u>26'-6"</u>	

MEASUREMENTS IN FEET

L1	Total Borehole depth	<u>40'</u>
L2	Casing depth	<u>26.3'</u>
L3	Depth to top of screen	<u>6'</u>
L4	Depth to filter material	<u>4'</u>
L5	Depth to seal material	<u>1'</u>
L6	Depth to backfill material	<u>-</u>
L7	Screen length	<u>20'</u>
L8	Height of filter above screen	<u>2'</u>
L9	Thickness of filter material	<u>22.5'</u>
L10	Thickness of seal material	<u>3'</u>
L11	Thickness of backfill material	<u>-</u>

A1	Backfill material	<u>-</u>
A2	Filter material	<u>Cohesive Silica 10/20</u>
A3	Seal material	<u>benzene chips</u>
A4	Backfill material	<u>-</u>
A5	Surface seal material	<u>concrete</u>

PVC Screen Casing Diameter 4"
 Screen Slot Size (Inches) 0.01"
 PVC Blank Casing Diameter 4"
 Depth to Water (FL) -

Remarks

14 bags Cohesive Silica 10/20

2 bags benzene chips

Recorded By <u>R. Rose</u>	Checked By <u>R. Lillie</u>	Date <u>10/1/99</u>
----------------------------	-----------------------------	---------------------

Well Installation (Flush)				Document Control	Page 1 of 1
Installation I.D. <u>PSNS</u>		CTO Number <u>0131</u>		Site I.D. <u>OU-B</u>	
Location I.D. <u>MW-715</u>		Well Owner <u>NAVY</u>		Logging Company <u>URS</u>	
Date Started <u>8-21-95</u>		Date Completed <u>8-21-95</u>		Installing Company <u>Tacone Pump</u>	
Casing Diameter (In) <u>2"</u>		Borehole Diameter (In) <u>8"</u>		Formation of Completion <u>Upper Shallow</u>	
				Screen Zone <u>9-39'</u>	

MEASUREMENTS IN FEET

L1	Total Borehole depth	<u>34'</u>
L2	Casing depth	<u>29'</u>
L3	Depth to top of screen	<u>9'</u>
L4	Depth to filter material	<u>4'</u>
L5	Depth to seal material	<u>1'</u>
L6	Depth to backfill material	<u>1'</u>
L7	Screen length	<u>20'</u>
L8	Height of filter above screen	<u>3'</u>
L9	Thickness of filter material	<u>23'</u>
L10	Thickness of seal material	<u>5'</u>
L11	Thickness of backfill material	<u>5'</u>

A1	Backfill material	<u>Native</u>
A2	Filter material	<u>Colorado silica / 10-20</u>
A3	Seal material	<u>Bentonite chip</u>
A4	Backfill material	<u>Bentonite chip</u>
A5	Surface seal material	<u>concrete</u>

PVC Screen Casing Diameter	<u>2"</u>
Screen Slot Size (Inches)	<u>0.01</u>
PVC Blank Casing Diameter	<u>2"</u>
Depth to Water (FL)	<u>12</u>

Remarks

12 bags of sand

3 bags of bentonite

2 bags of concrete

Recorded By <u>Rose</u>	Checked By	Date
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10/1/92

Lithologic Log (Soil)										Borehole No. MW-715		Page 1 of 2	
Client <u>Navy / PSNS</u>				Project <u>CTO-0131</u>		Site <u>(OVB)</u>		Zone <u>—</u>					
Location <u>715</u>		Location Type <u>MW</u>		Construction Method <u>HSA</u>		Borehole Diameter (Inches) <u>8</u>							
Total Depth (Feet) <u>36</u>		Ground Elev. (Fl. MSL) <u>11.944</u>		Drilled by (company) <u>Tacoma Pump + Drilling</u>									
Supervised by (company) <u>URS / R. Rose</u>				Date Started <u>8-21-95</u>		Date Completed <u>8-21-95</u>							
NOTE: Indicate sample intervals and depths water encountered. <u>12 ft</u>													
Depth (ft)	Sample Number	Sampling Method	Blow Count / 6 in	Recovery (in)	USCS Symbol	Strata	Lithologic Description	LEL	OVM / FID	Particulate	Other (Specify)		
	26224	H _{AD}	—	—	GM		6" Asphalt						
	—	H _{AD}	—	—	SM		Silty Gravel, sand-silt mixtures, dry, Brown, gravel SA-SR 1/8"-3/4" Fill	0	0	0			
	—	—	—	—	—		Silty Sands, sand-silt mixtures, dry Brown, trace gravel SA-SR 1/8"-1/4" Fill	0	0	0			
-5	—	S	32/24/30	16	SM		same	0	0	0			
	—	S	6/9/9	14	SM		same	0	0	0			
-10	26225	S	9/9/9	16	SM		same	0	0	0	TCLP mwp		
	26226	S	5/8/5	16	SM		same but very moist/wet	0	0	0			
	—	S	6/11/13	18	SM		same	0	0	0			
-15	—	S	9/9/8	12	SM		same w/ trace gravel SA-SR 1/4"-3/4" turning grey	0	0	0			
	—	S	1/5/5	5	SM		same	0	0	0			
-20	—	S	1/2/6	6	SM		same	0	0	0			
	26227	S	1/3/15	8	SM		Silty Sands, sand-silt mixtures, wet, Black w/ite, shell fragments, oil - 5.1 ppm	0	0	0			
	—	S	8/11/17	10	SM		same w/ trace gravel SA-SR 1/8"-1/4" Fill	0	0	0			
-25	—	S	3/12/28	10	SM		same w/ wood	0	0	0			
	—	S	20/30/20	16	SP		Gravelly sand - no silt, gravel SA-SR 1/8"-3/8" wet, Black, wire, brick	0	0	0			
	—	S	4/4/18	18	SP		same w/ pine needles	0	0	0			
Remarks <u>SR subrounded, SA-subangular</u>													

Location Type		Construction Method		Sampling Method	
BH	Borehole	AP	Air Percussion	C	Continuous
MW	Monitoring Well	AR	Air Rotary	D	Drill Cuttings
		CT	Cable Tool	H	Hand Auger
		HA	Hand Auger	L	Tube Liner
		HS	Hollow Stem Auger	S	Split Spoon
		RR	Reverse Rotary	T	Shelby Tube

Recorded By <u>R. Rose</u>	Checked By	Date
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<h2 style="margin: 0;">Lithologic Log (Soil)</h2>						Borehole No. MW-715		Page 2 of 2			
Client Navy / PSNS			Project LTO-D131		Site 04 B		Zone —				
Location 715		Location Type MW		Construction Method HSA		Borehole Diameter (Inches) 8					
Total Depth (Feet) 36		Ground Elev. (Ft. MSL) 11.944		Drilled by (company) Tacoma Pump + Drill							
Supervised by (company) URS / R. Rose			Date Started 8-21-95		Date Completed 8-21-95						
NOTE: Indicate sample intervals and depths water encountered. 12 ft											
Depth (ft)	Sample Number	Sampling Method	Blow Count / 6 in	Recovery (in)	USCS Symbol	Strata	Lithologic Description	LEL	OVM / FID	Particulate	Other (Specify)
	—	S	4 1/6 / 7	20	SM		silty sands, sand-silt mixtures, wet, black trace gravel SA-SR 1/8-1/2", grey sandy silt cohesive, slight organic odor Fill	0	0	0	
	—	S	2 3/4	18	SM		same / no gravel, w/wire and shell fragments Fill	0	0	0	
35	26228	S	10 15/40	18	SM		same / no gravel or wire, abundant shell fragments Native	0	0	0	
screened between 9-29 ft sand to 6 ft Bentonite to 1 ft 12 bags of sand 3 bags of Bentonite 2 bags of concrete											
Remarks SA - subangular, SR - subrounded											
Location Type				Construction Method				Sampling Method			
BH Borehole MW Monitoring Well				AP Air Percussion AR Air Rotary CT Cable Tool				HA Hand Auger HS Hollow Stem Auger RR Reverse Rotary			
				C Continuous D Drill Cuttings H Hand Auger				L Tube Liner S Split Spoon T Shelby Tube			
Recorded By R. Rose				Checked By				Date			



FINAL
28 FEBRUARY 2006

Operation and Maintenance Plan

Bremerton Naval Complex

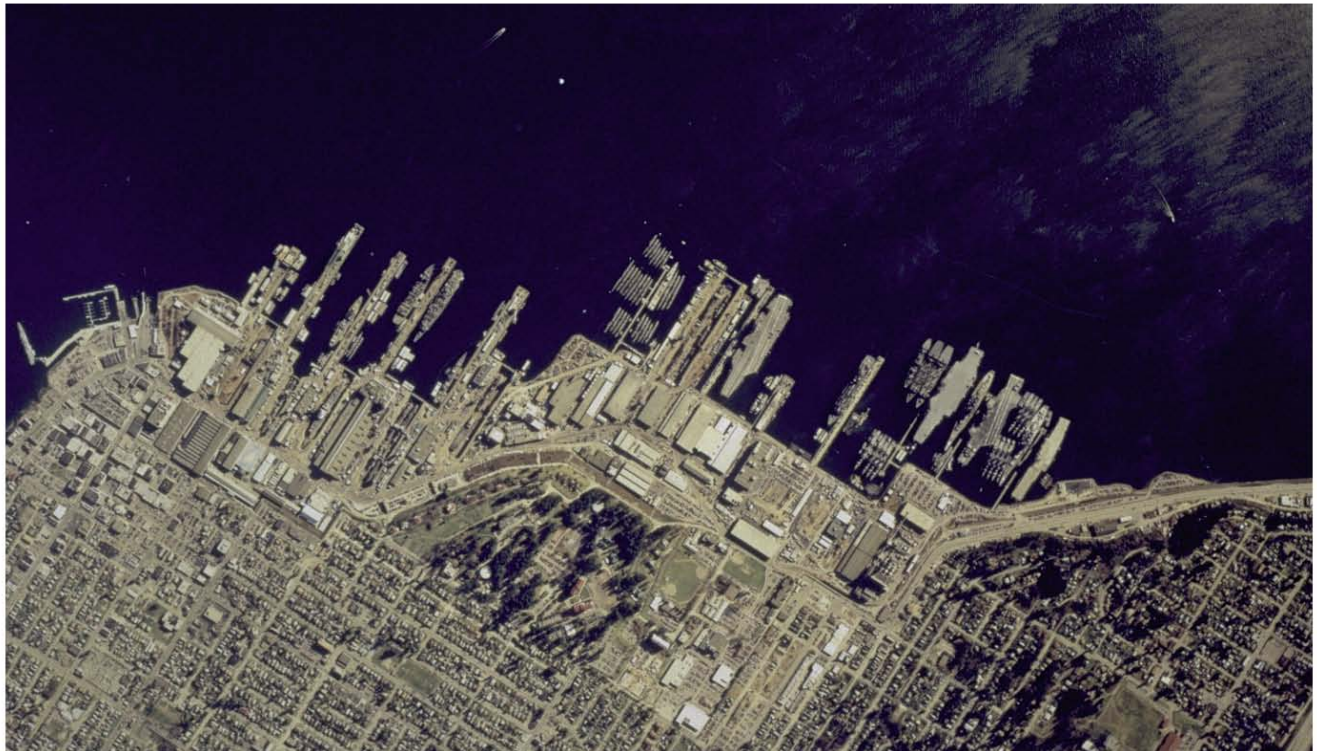
Bremerton, Washington

Department of the Navy

Naval Facilities Engineering Command Northwest

1101 Tautog Circle, Suite 203

Silverdale, WA 98315-1101



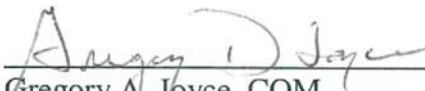
CONTRACT NO. N44255-01-D-2000
RAC 3/TASK ORDER 18

FINAL OPERATION AND MAINTENANCE PLAN
BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON


TETRA TECH EC, INC.

FEBRUARY 28, 2006

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ACRONYMS AND ABBREVIATIONS

BNC	Bremerton naval complex
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
IC	Institutional Control
MTCA	Model Toxics Control Act
NAVFAC NW	Naval Facilities Engineering Command Northwest
NFESC	Naval Facilities Engineering Service Center
NBK	Naval Base Kitsap
NCP	National Contingency Plan
NPL	National Priorities List
NSC	Naval Supply Center
O&M	Operation and Maintenance
OU	Operable Unit
PSNS & IMF	Puget Sound Naval Shipyard and Intermediate Maintenance Facility
RAO	remedial action objective
ROD	Record of Decision
SOP	Standard Operating Procedure

1. INTRODUCTION

This Operation and Maintenance (O&M) Plan discusses the inspection and maintenance requirements identified in the Records of Decision (RODs) for Operable Units (OUs) at the Bremerton naval complex (BNC) located in Bremerton, Washington. In May 1994, the U.S. Environmental Protection Agency (EPA) placed the BNC on the National Priorities List (NPL). After this listing, the BNC was divided into several OUs. The OUs are listed below and are shown on Figure 1-1.

- OU A
- OU B Marine
- OU B Terrestrial
- OU C
- OU Naval Supply Center (NSC)
- OU D

In the respective RODs, the Navy has committed to O&M activities for OUs A, B Marine, B Terrestrial, NSC, and D. OU C is a petroleum site managed under the Model Toxics Control Act (MTCA) and is therefore not included in this plan. OU D is included in this plan until the transfer of the property to the City of Bremerton is complete; following which any inspections or maintenance of OU D will be performed by the City. The deed of transfer, legal description, and the associated covenants for OU D are included in Appendix B. Note that while the stem wall area adjacent to the ferry terminal does transfer, the shoreline below the high water mark by OU D is part of OU B Terrestrial and will not be transferred. The stem wall is shown as shoreline segments 41A and 41B on Figure 4-1.

The National Contingency Plan (NCP) requires O&M Plans as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) cleanup process. The remedy used for OUs A, B Marine, B Terrestrial, NSC, and D did not include ongoing active operations; therefore, this O&M Plan consists of inspection and maintenance procedures. Table 1-1 lists the inspection and maintenance requirements identified for each OU. The respective RODs are cited in Section 6.

Table 1-1. Inspection and Maintenance Matrix

Operable Unit	Institutional Controls	Excavation Management	Pavement/Vegetative Cap	Shoreline	Storm Drains/Catch Basins	Monitoring Wells
A	x	x	x	x		x
B Terrestrial	x	x	x	x	x	x
B Marine	x			x		
D	x		x		x	x
NSC	x	x	x		x	x

The remedial action objective (RAO) for BNC includes remedies designed to contain contaminated soil or sediment, and to prevent contaminated fill material and leachate from migrating to the marine environment. Four potential pathways exist:

1. Storm water infiltrating fill and groundwater (OU A) from the ground surface, thereby creating leachate.
2. Storm water infiltrating fill material through damaged or defective storm drain piping, thereby creating leachate.
3. Fill material and groundwater (OU NSC, OU B, OU D) infiltrating damaged or defective storm drain piping, thereby getting flushed to the marine environment.
4. Erosion and/or slope failure along the shoreline.

The RAOs are implemented through four distinct remedies. The remedies and the respective section in this plan where they are addressed are listed below:

- Section 2 – Pavement caps and vegetative covers at BNC to minimize infiltration
- Section 3 – Catch basins to prevent contaminant migration to Sinclair Inlet
- Section 4 – Erosion control structures along the shoreline
- Section 5 – Institutional controls (ICs) implemented to restrict access or exposure to affected media.

This plan describes each remedy and provides the inspection criteria to monitor the effectiveness of the remedial design implemented at each OU. Checklists are provided to facilitate the inspections, accordant documentation, and any required maintenance or repairs. Decision trees are included to provide actions required in the event that a need for maintenance and/or repair is identified. All actions, regardless of degree or method, must comply with the ROD.

If a ROD remedy fails on its own and this failure is not due to actions of Naval Base Kitsap (NBK) at Bremerton or Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF), or is not considered a routine maintenance and repair action, the repairs will be made using ERN funds. If NBK at Bremerton or PSNS & IMF modifies a remedy after the remedial action has been conducted and the remedy is in place, these repairs will not be made using ERN funds. The failure will be documented during the ROD-required inspection and the appropriate environmental office will be notified of the failure. This includes the vegetated and shoreline portions of the base known as Charleston Beach (shoreline segment 43 in Figure 4-1).

The evaluation of the shoreline system under OU B Terrestrial identified that the quay wall, sheet pile wall, and concrete seawall in shoreline segments 5-16 and 20-39 (Figure 4-1) met the ROD objective of controlling migration of site contaminants due to infiltration or erosion. No remedial actions were conducted at these locations. The inspection and repairs to the quay wall, sheet pile wall, and concrete seawalls in the above-mentioned shoreline segments will be performed by the appropriate oversight office using non-ERN funds. The inspection of these shoreline segments is not addressed in this O&M Plan.

Although a ROD requirement, groundwater monitoring and inspection of monitoring wells are not included in this document. These aspects of the remedy are accomplished under a separate long-term monitoring contract.

As part of the inspection and review process for the OUs, this O&M Plan will undergo periodic review to ensure continued effectiveness. A Revisions Log is included as Appendix A.

The Standard Operating Procedure (SOP), Excavation Management at Bremerton Naval Complex, is included in this Plan as Appendix C. Material specifications and as-built drawings for remedy components are included in an electronic format in Appendix D. Section 6 provides the references that the material specifications and drawings were excerpted from. Changes to the material specifications and drawings should be anticipated as construction and remedy work is accomplished at the BNC. The revisions will be logged in Appendix A.

1.1 INSPECTION REQUIREMENTS

Periodic inspections will be conducted to evaluate the condition of remedy components and effectiveness of ICs. Inspections will be documented, with the records maintained by Naval

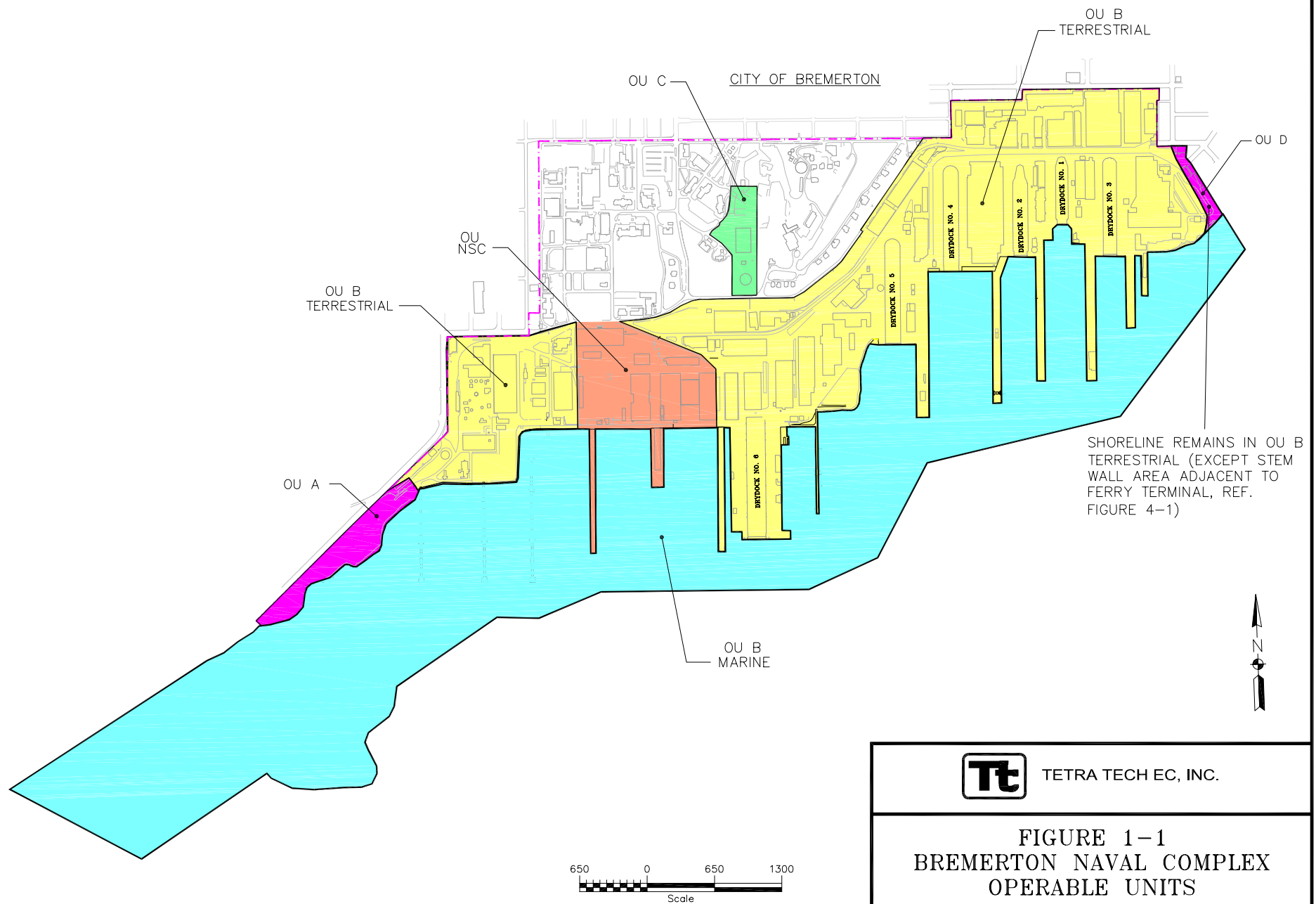
Facilities Engineering Command Northwest (NAVFAC NW) and used to support the EPA-mandated 5-year review.

NAVFAC NW will contract to have the periodic inspections performed using ERN funds. This contract will continue for 5 years after the last remedy is in place for the last OU (estimated to be 2006 with O&M inspections continuing through 2011). After this date, it will become the responsibility of the facility owner to fund these inspections until concentrations of hazardous substances in the soil and groundwater are at such levels to allow for unlimited use and unrestricted exposure.

1.2 MAINTENANCE AND REPAIRS

The maintenance and repairs sub-sections provide the decision tree to determine if repairs are required to preserve the integrity of the ROD remedies. In general, if repairs are needed as a result of construction activities (pipeline repair, installation of fencing, etc.), the repairs should be completed in accordance with the materials and specifications listed in Appendix D. Appendix D provides record drawings and specifications for the remedies implemented at OUs A, B Terrestrial, D, and NSC. When a repair is required, the repair action will need to be evaluated to ensure the ROD remedy is maintained. If repairs other than those specified in Appendix D are desired, approval is required before construction commences from the NAVFAC NW Environmental Department. Appropriate health and safety requirements for completing the repairs must be followed.

Repairs that are conducted as a result of ROD inspections will be documented in reports prepared by NAVFAC NW. The reports will summarize the work activities performed, including the materials used, specifications followed and any quality control inspections or testing that is conducted. The inspection reports will contain any of the appropriate checklists that are used during the inspection.



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FIGURE 1-1
BREMERTON NAVAL COMPLEX
OPERABLE UNITS

2. PAVEMENT CAP AND VEGETATIVE COVER

2.1 INSPECTIONS

The RODs for OU A, B Terrestrial, D, and NSC required installation or upgrades and repairs to the existing pavement cap. In some instances, a vegetative cover was used in lieu of pavement. The affected areas where either a pavement cap or a vegetative cover is in place as part of the ROD remedy are shown on Figure 2-1. The pavement and vegetative improvements serve to fulfill the goal of reducing leachate migration to Sinclair Inlet. Inspection and maintenance of the pavement caps and vegetative covers is to ensure these remedies continue to seal the contaminated fill and route storm water effectively to the storm drain system. Table 2-1 provides a checklist describing the frequency of required cap inspections. Observations will be documented on the checklist, and via photographs, if necessary.

2.2 MAINTENANCE AND REPAIR

Areas that are considered significant sources of possible infiltration will be repaired to preserve the integrity of the ROD remedy. Figures 2-2 and 2-3 provide the decision diagrams for determining if there is a significant source of infiltration that requires repair.

Pavement repair specifications and vegetation recommendations are provided in Appendix D.

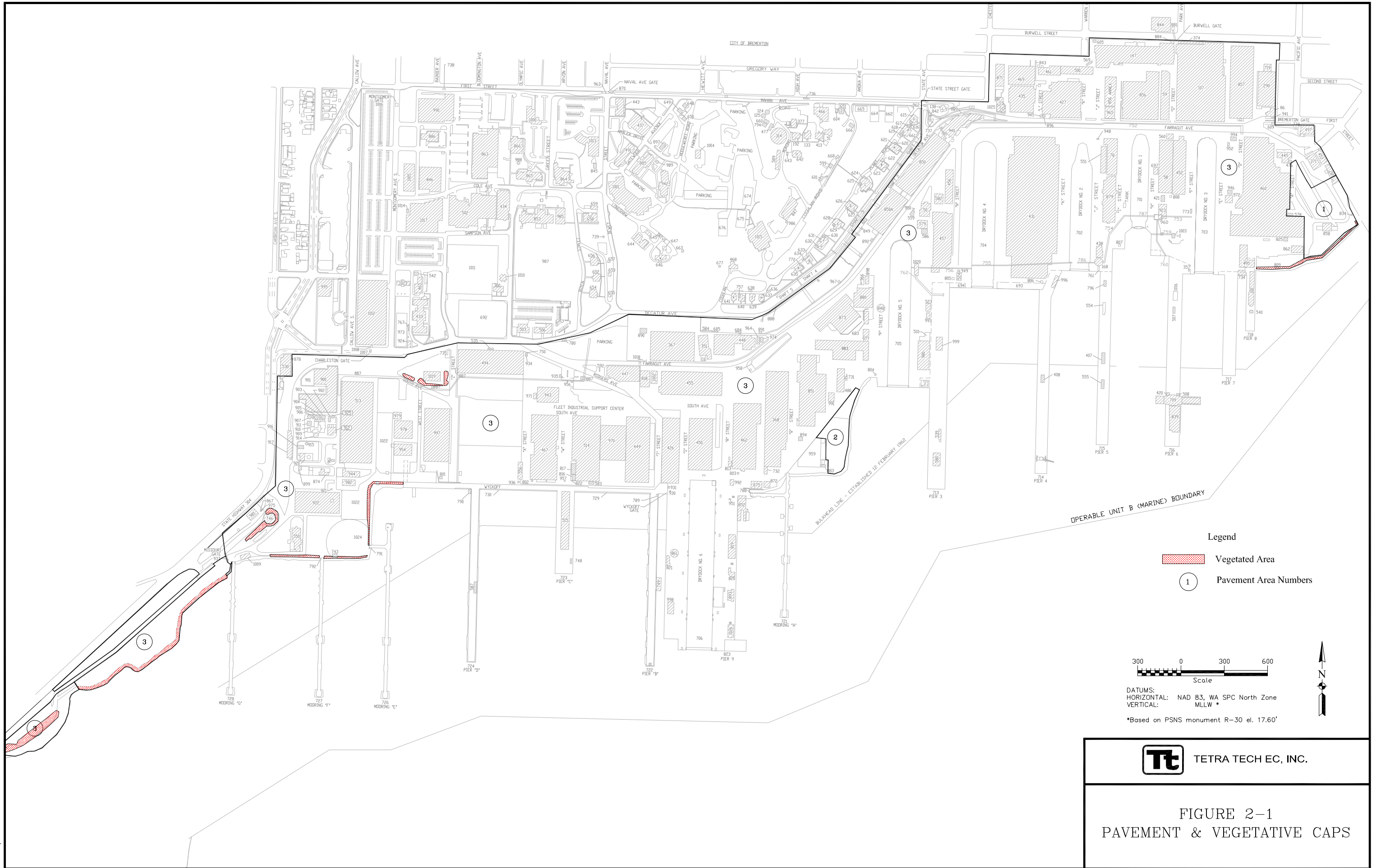


Table 2-1. Pavement Caps and Vegetative Covers Inspection Checklist

Inspection Frequency/ Responsible Party	Evaluation Criteria	Inspector, Date and Time	Location of Impacted Area ^{1/}	Inspection Complete (Y/N)	Repairs Required?	Comments, Observations, Persons Notified
Annually by NAVFAC NW	Visually inspect paved surfaces (including asphalt and concrete patches) for potential infiltration into underlying soil. Look for gaps, cracks, and joints in asphalt, concrete, or curbing. How large of an area is impacted? ^{2/}					
Annually by NAVFAC NW	Is seal coating impaired allowing infiltration of storm water? How large of an area is impacted?					
Annually by NAVFAC NW	Visually inspect pavement for localized settlement. Is the settlement greater than 6 inches in depth?					
Annually by NAVFAC NW	Visually inspect the vegetative strips for erosion and settling. Is the top soil adequate to support healthy vegetation?					
Annually by NAVFAC NW	Visually inspect the vegetation bank along Charleston Beach. Is native material visible? Are plant roots visible?					

^{1/} List nearest building number, street name, fish grate number, or shoreline segment number.

^{2/} Potential areas of concern where deterioration may occur include:

- Points where older asphalt concrete (referred to as “asphalt”) is in contact with newer asphalt, or in contact with concrete
- Locations where asphalt is in contact with drainage structures (e.g., storm drains, catch basins, etc.)
- Locations where asphalt is in contact with railroad tracks, ties, switch gear, and railroad equipment
- Locations where asphalt is in contact with miscellaneous entities including monitoring wells, manholes, or hand holes
- Areas of ponded water

Figure 2-2. Pavement Cap Inspection and Maintenance Decision Diagram

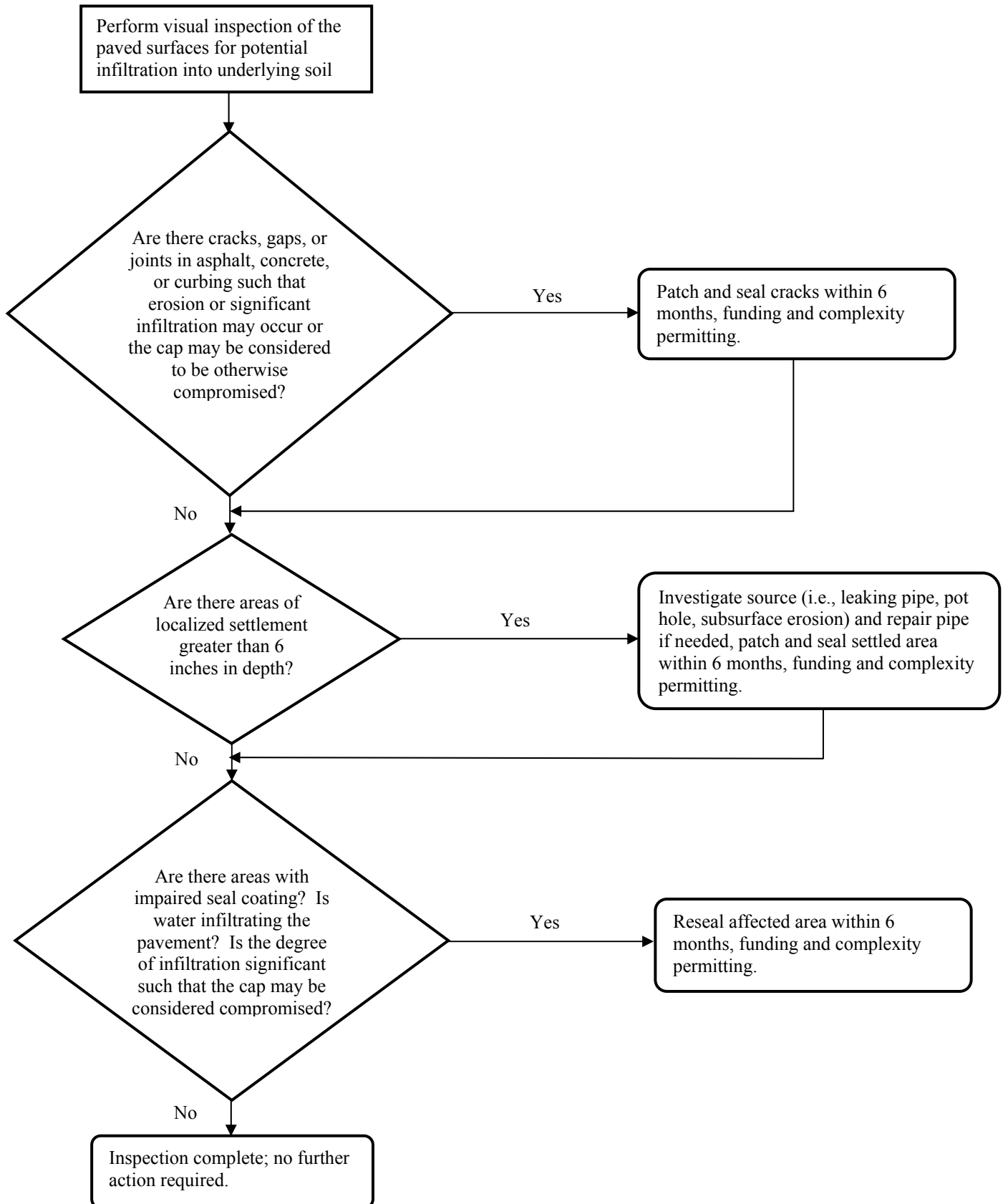
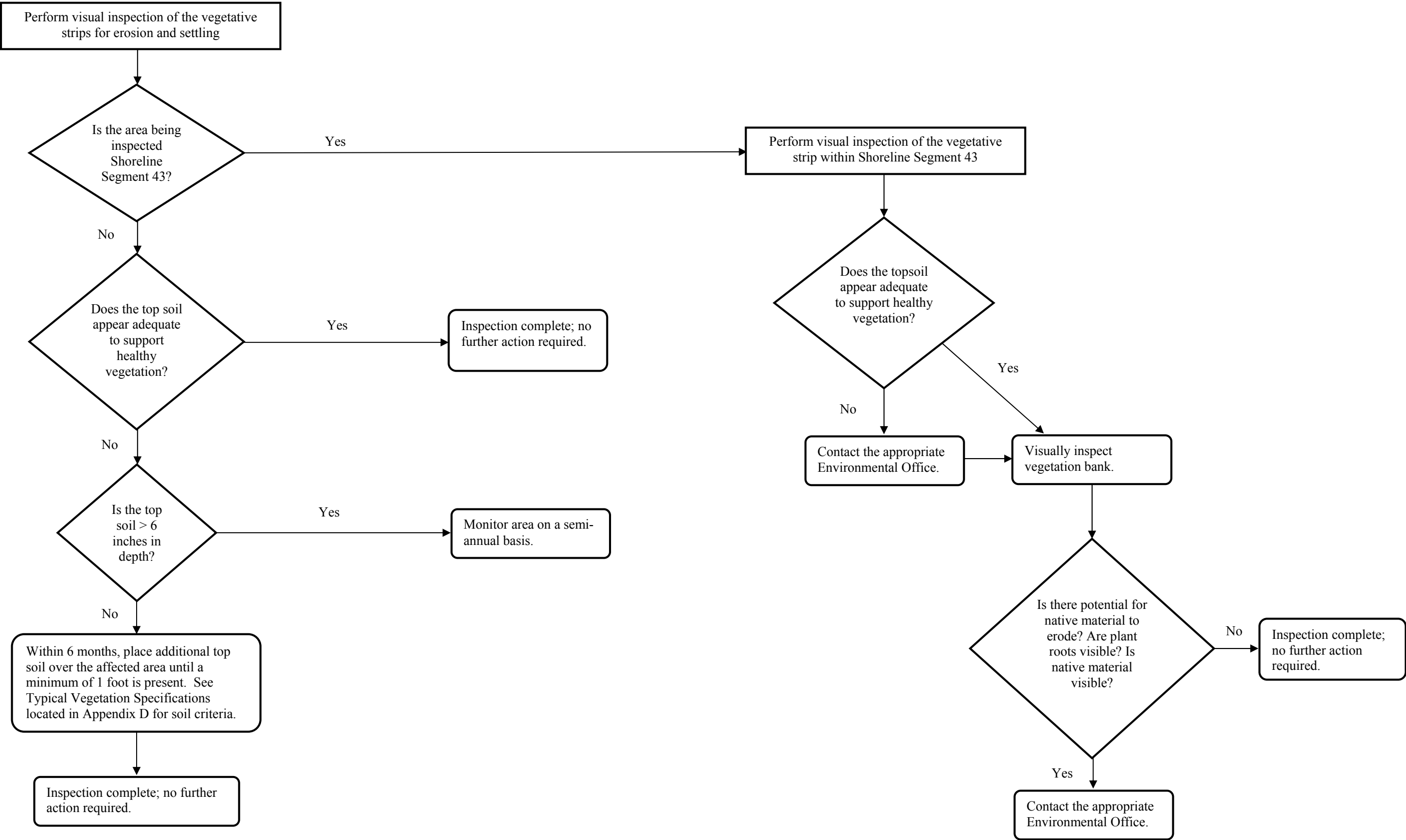


Figure 2-3. Vegetative Cover Inspection and Maintenance Decision Diagram



3. CATCH BASINS

3.1 INSPECTIONS

The OU B Terrestrial, D, and NSC RODs prescribed inspection, cleaning, and repair of the storm drain system as remedy components. These remedy components are complete. The storm drain improvements serve to fulfill the goal of preventing migration of contaminated fill and leachate from reaching Sinclair Inlet. Catch basins are an integral part of the overall storm drain system. Inspection and maintenance of the catch basins is required to ensure the storm drain system is in good condition; that storm water discharges to Sinclair Inlet without contacting the fill material; and to prevent infiltration of fill material and leachate into the storm drain system.

The primary inspection point for the storm drain system shall be the last catch basin of the system prior to discharge to Sinclair Inlet. The catch basin requiring inspection could be a manhole. The catch basin shall be checked at low tide and during a rain event. The particular catch basins requiring inspections are shown on Plates 1 and 2.

PSNS & IMF has developed procedures to implement operation and maintenance requirements identified in Volume 1 of the Stormwater Management Manual for Western Washington. NAVFAC NW will review PSNS & IMF catch basin maintenance records annually for conformance with ROD requirements and provide EPA and Washington State Department of Ecology (Ecology) with inspection reports annually as well as formally report the results in the 5-Year Review.

Table 3-1 provides a checklist describing the frequency of required catch basin inspections. Observations will be documented on the checklist and with photographs.

3.2 MAINTENANCE AND REPAIRS

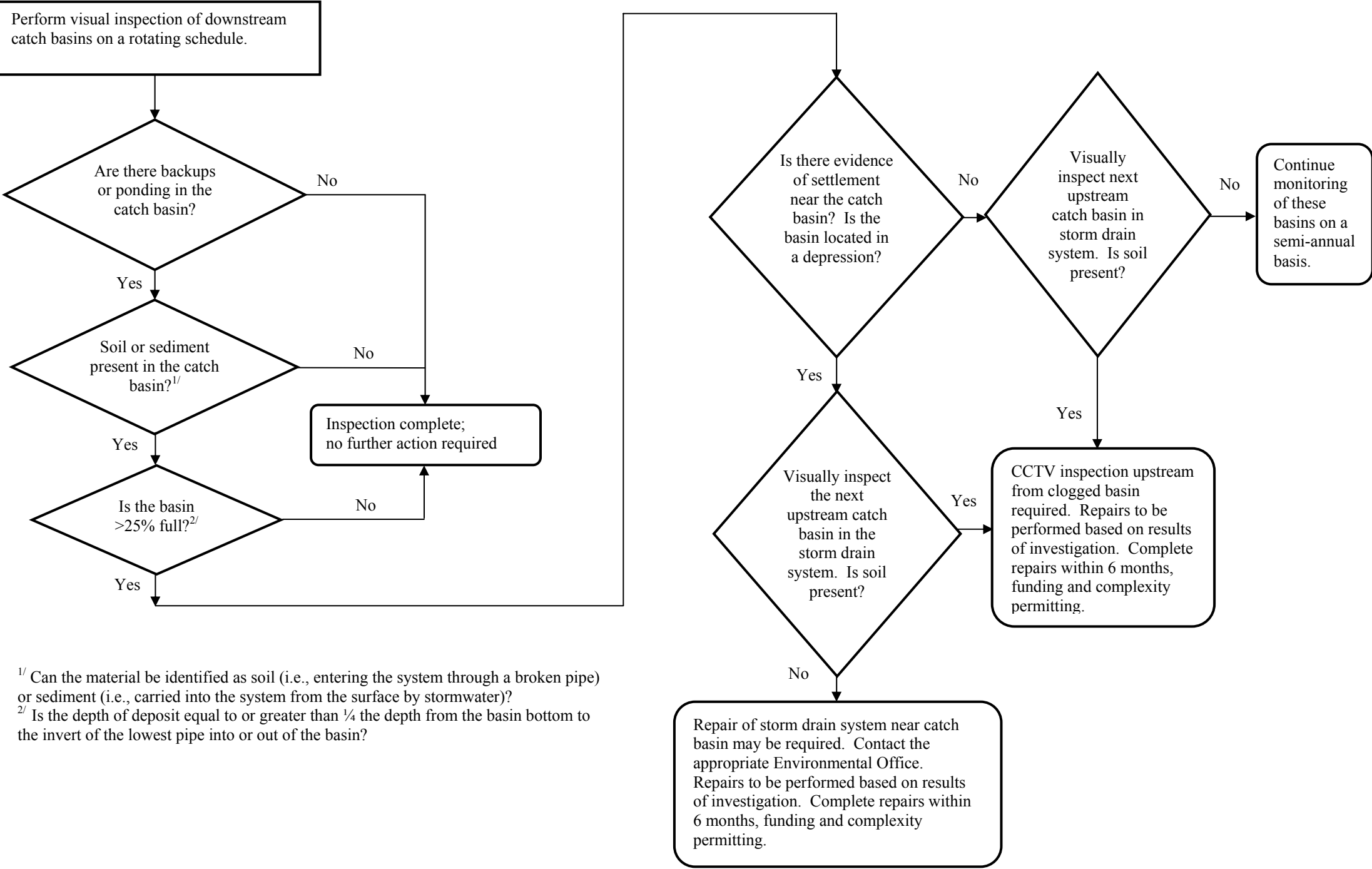
Catch basins and storm drain systems that show signs of fill material infiltration shall be repaired. Figure 3-1 provides the decision diagram for determining if repairs are needed. Catch basin repair may include installing cement grout in damaged areas, replacing part or all of the structure, or repairing pavement surrounding the catch basin. Specifications concerning the catch basin construction and materials are included with the as-built drawings (Appendix D). Applicable storm drain lines will be repaired as necessary based on the results of the inspection. Repairs will be completed within 6 months after discovery, if possible, considering the complexity of repair and funding.

Table 3-1. Catch Basin Inspection Checklist

Inspection Frequency/ Responsible Party	Evaluation Criteria	Inspector, Date and Time	Catch Basin Number	Catch Basin Type ^{2/}	Depth of Catch Basin	Soil or Sediment Present in Catch Basin	Depth of Sediment/ Soil	Depth from the Catch Basin Bottom to the Invert of the Lowest Pipe into or out of the Catch Basin	Depth of Drainage Water Present ^{4/}	Evidence of Settlement or Cracks?	Inspection Complete (Y/N)	Repairs Required?	Comments, Observations, Persons Notified
Annually by NAVFAC NW	Visually inspect catch basins ^{1,3/} . Measure total depth of catch basin. Measure any soil/sediment buildup. Is more than 1/4 of the outlet blocked? Are there ponding or back-ups in the catch basin? Look at the grain size of the material. Is it soil (such as might be present from a broken pipe) or sediment (such as might have washed in)?												
Annually by NAVFAC NW	Review Public Works records to confirm their storm water maintenance program was implemented in accordance with the procedure developed to meet the Washington State Stormwater Management Manual for Western Washington.												

^{1/} Only inspect those catch basins just upstream from Sinclair Inlet; the last catch basin on the storm drain system prior to discharge to Sinclair Inlet.
^{2/} Type I catch basins are small with rectangular grates used for storm water collection on streets and parking lots. Type II catch basins are larger with rounded manhole covers and are usually used in storm water trunk lines for larger flow.
^{3/} Measure and record depth of deposits; check appearance of material in catch basin (oily sheen, discoloration).
^{4/} Are there backups and ponding in catch basins?

Figure 3-1. Catch Basin Inspection and Maintenance Decision Diagram



4. SHORELINE

4.1 INSPECTIONS

The RODs for OU A, B Marine, and B Terrestrial required shoreline improvements. The shoreline improvements serve to fulfill the goal of preventing the erosion of contaminated fill into Sinclair Inlet. Inspection and maintenance of the shoreline is required to ensure it continues to contain the contaminated fill. The shoreline segments requiring inspection are shown on Figure 4-1.

Table 4-1 provides a checklist describing the frequency of required shoreline inspections. Because much of the shoreline is not readily visible from land, inspections will be conducted from both land and water. To facilitate documentation of the inspection, the shoreline was divided into segments based on type of construction, abrupt changes in direction of the shoreline, and permanent shoreline features such as piers and moorings. These segments are delineated on Figure 4-1. To allow inspection of the lower portions of the seawall, inspections should coincide with periods of very low tide. Observations will be documented on the checklist and via photographs.

Shoreline inspections will be conducted in selected areas where ROD-required remedies were implemented. These areas include the armor rock seawall (shoreline segments 1 through 4, 17 through 19, 40, 41A, and 42 through 44), and the sheet pile walls adjacent to the Missouri Gate (shoreline segment 44).

An inspection of the entire shoreline is conducted every 5 years by the Naval Facilities Engineering Service Center (NFESC). These 5-year inspection reports will be evaluated as part of the CERCLA 5-year review.

4.2 MAINTENANCE AND REPAIRS

Areas that show evidence of sloughing or erosion along the armor rock seawall or the sheet pile walls adjacent to the Missouri Gate will be evaluated for repair (see Figure 4-1). Figure 4-2 provides the decision diagram for determining if repairs are needed. Previous inspection results will be reviewed to evaluate the rate of change and determine the urgency in completing the repairs. The results will be reviewed with the appropriate environmental office to determine the timeframe for completing the repairs, to determine if the remedy is meeting the ROD objectives, and if the remedy in place needs to be modified to maintain the ROD objectives.

Figures 4-3 and 4-4 provide the decision diagrams for determining if repairs or upgrades to shoreline segments 43 and 44 are required.

Shoreline stabilization specifications are provided in Appendix D.

Habitat restoration measures will not be routinely maintained. However, should the shoreline stabilization remedy fail, repair actions will include restoration of the established habitat. Habitat recommendations for various areas of the BNC are provided in Appendix D.

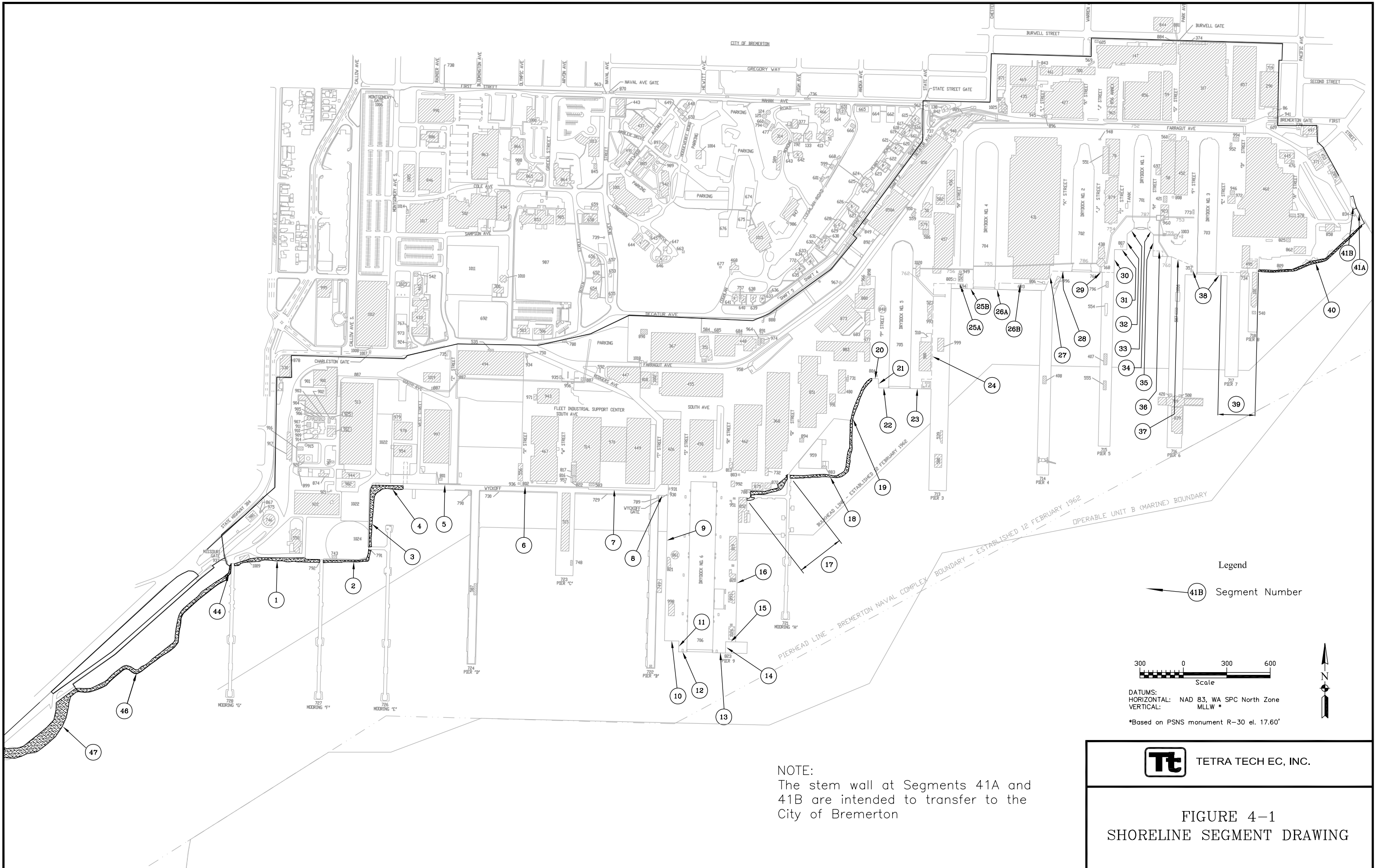
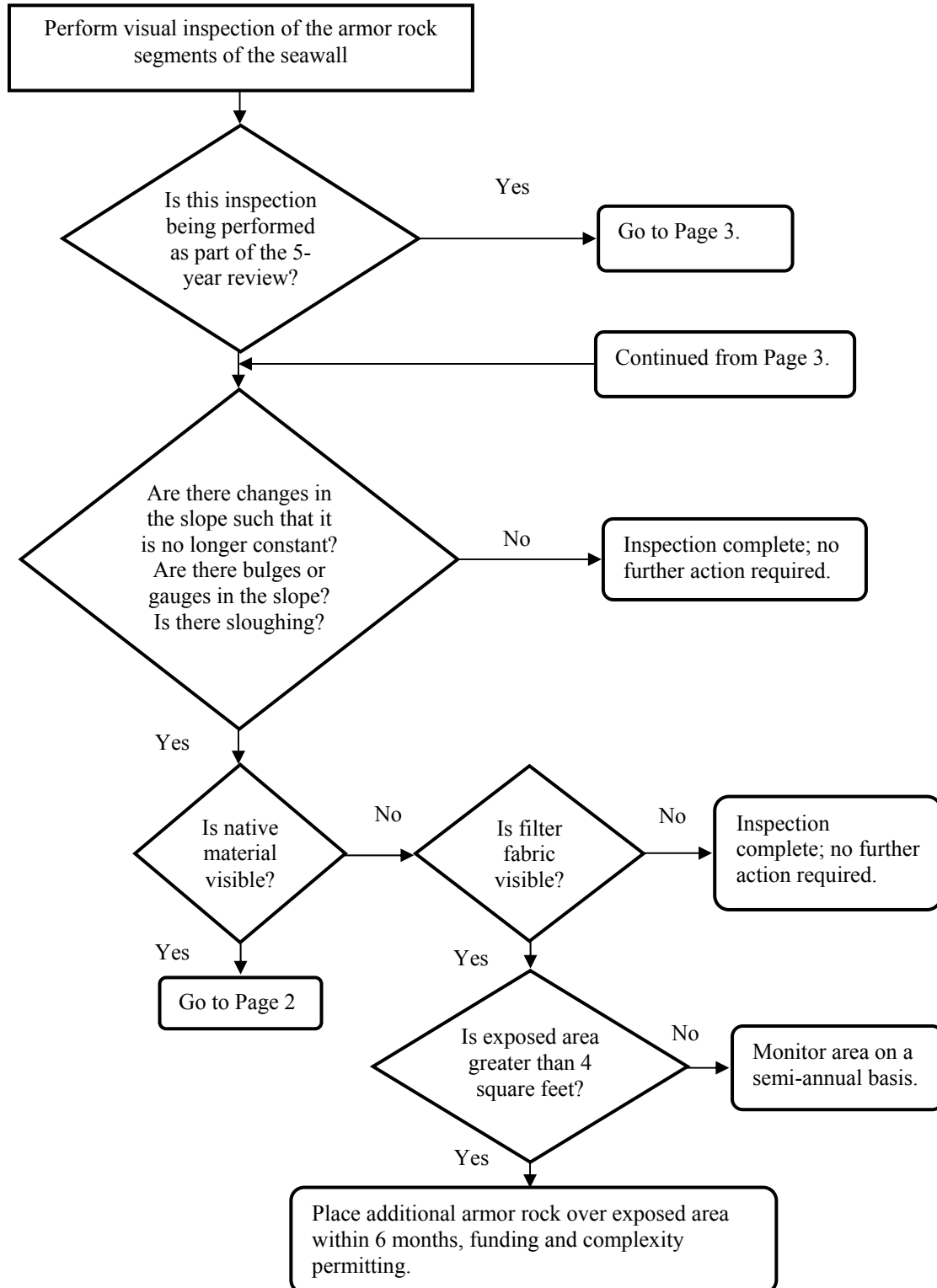


Table 4-1. Shoreline Inspection Checklist

Inspection Frequency / Responsible Party	Evaluation Criteria	Inspector, Date and Time	Segment Number/Location	Type of Armor ^{1/}	Est. Tidal Elevation MLLW (feet)	Inspection Complete (Y/N)	Repairs Required?	Comments, Observations, Persons Notified
Every 5 years (as part of 5-year review) by NAVFAC NW	Perform surveys of shoreline following established transects. Survey results will need to be compared to the baseline survey (or previous survey). Any slope changes?							
Every 5 years (as part of 5-year review) by NAVFAC NW	Review NFESC shoreline inspection report for any findings that may affect ROD remedy.							
Annually by NAVFAC NW	Perform visual inspection of the armor rock segments of the seawall (i.e., segments 1-4, 17-19, 40, 41A, 41B, 42-44). Check for changes in rock size and distribution, slope and armoring, and presence and distribution of debris. Is there evidence of sloughing, erosion, or settlement? Are there areas of exposed fill, construction debris, or scrap metal?							
Annually by NAVFAC NW	Perform visual inspection of the sheet pile wall segments (i.e., segment 44). Check for corrosion, cracking, or deflection of sheet pile; evidence of breakthrough exposing fill; evidence of erosion from behind the structure; water flowing from openings or cracks; presence of debris.							
Annually by NAVFAC NW	Perform visual inspection of the areas where the vegetative berm meets the seawall. Are holes or undercutting present?							
Annually (in spring) by NAVFAC NW	Visually inspect the three erosion gauges located along Charleston Beach (segment 43). Measure how much of each of the gauges is exposed (inches/feet). Action is required if greater than 1 foot is exposed.							
^{1/} Armor rock or sheet pile MLLW = mean lower low water								

Figure 4-2. Shoreline Inspection and Maintenance Decision Diagram—Armor Rock Seawall Segments (Page 1)



^{1/} segments 1-4, 17-19, 40, 41A, and 42-44 (Figure 4-1).

Figure 4-2. Shoreline Inspection and Maintenance Decision Diagram—Armor Rock Seawall Segments (Page 2)

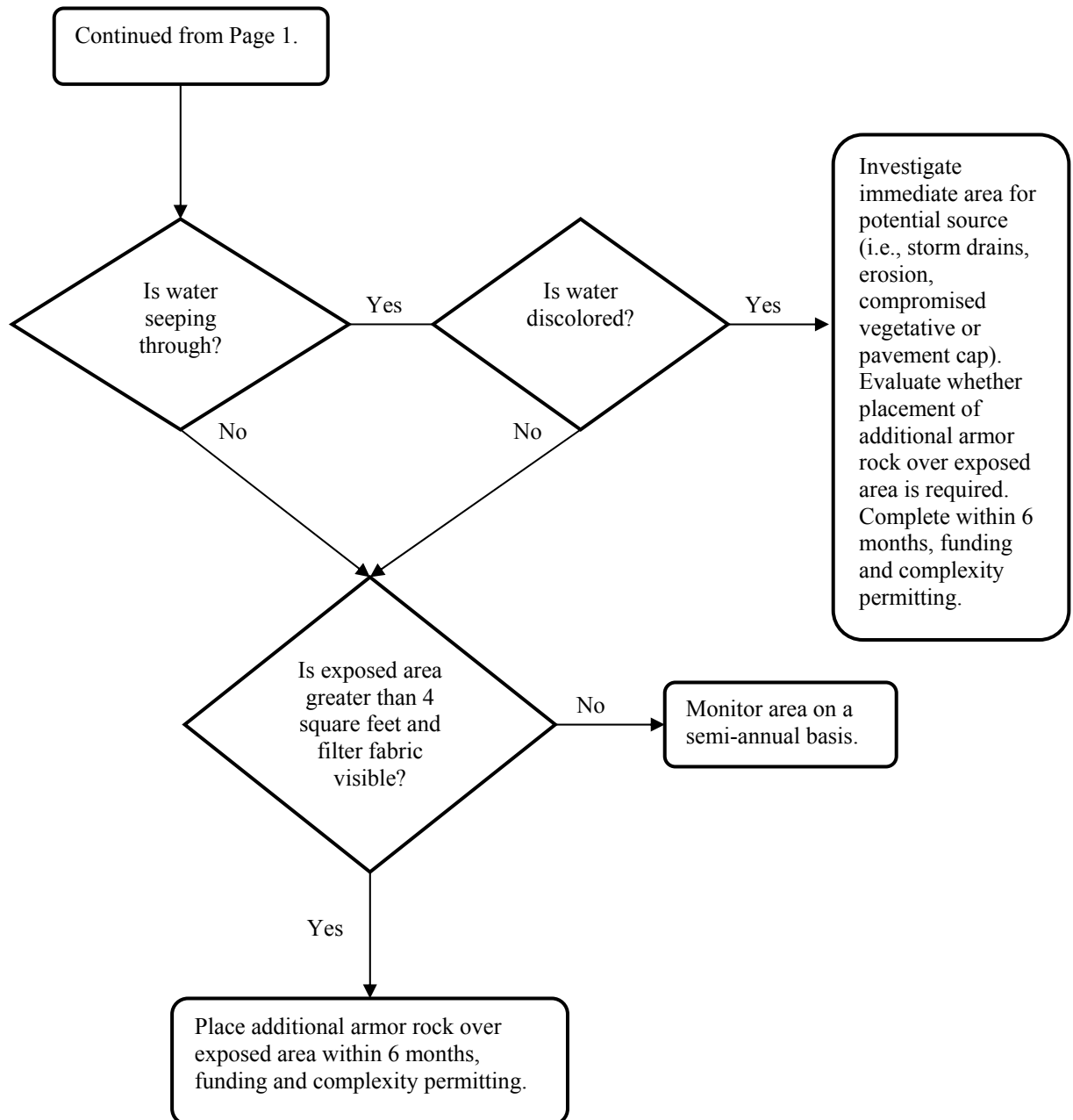


Figure 4-2. Shoreline Inspection and Maintenance Decision Diagram—Armor Rock
Seawall Segments (Page 3)

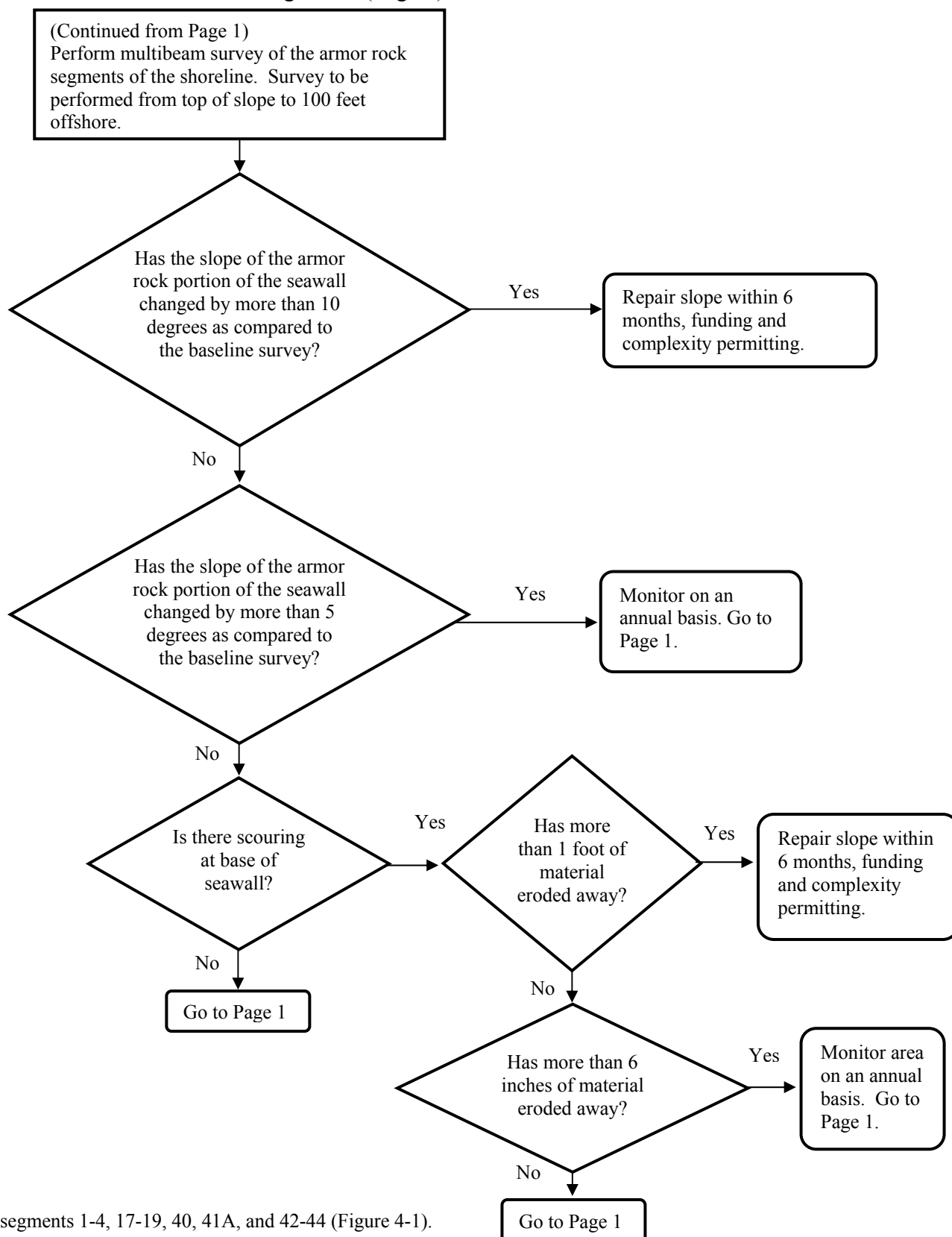


Figure 4-3. Shoreline Inspection and Maintenance Decision Diagram—Shoreline Segment 43

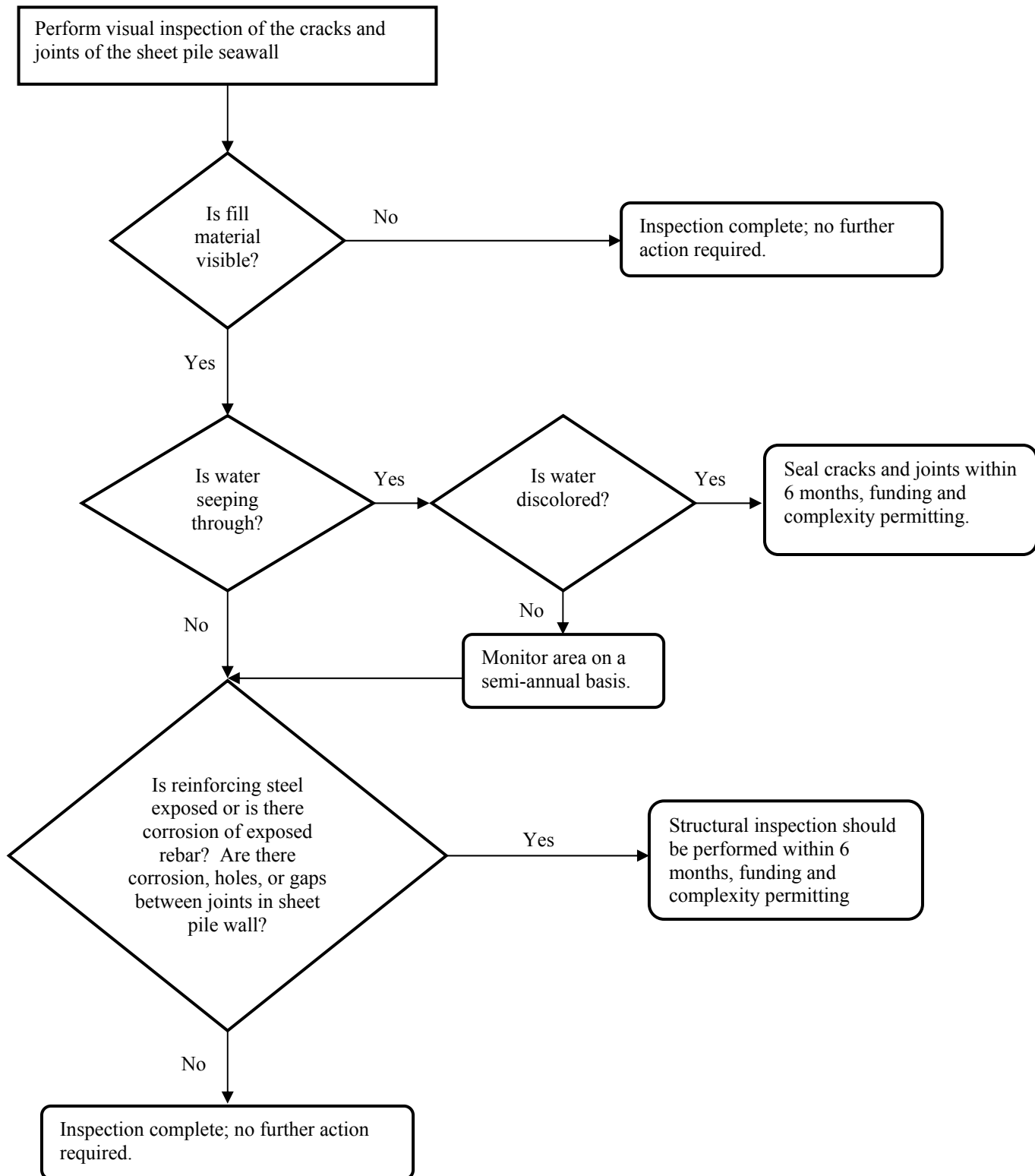
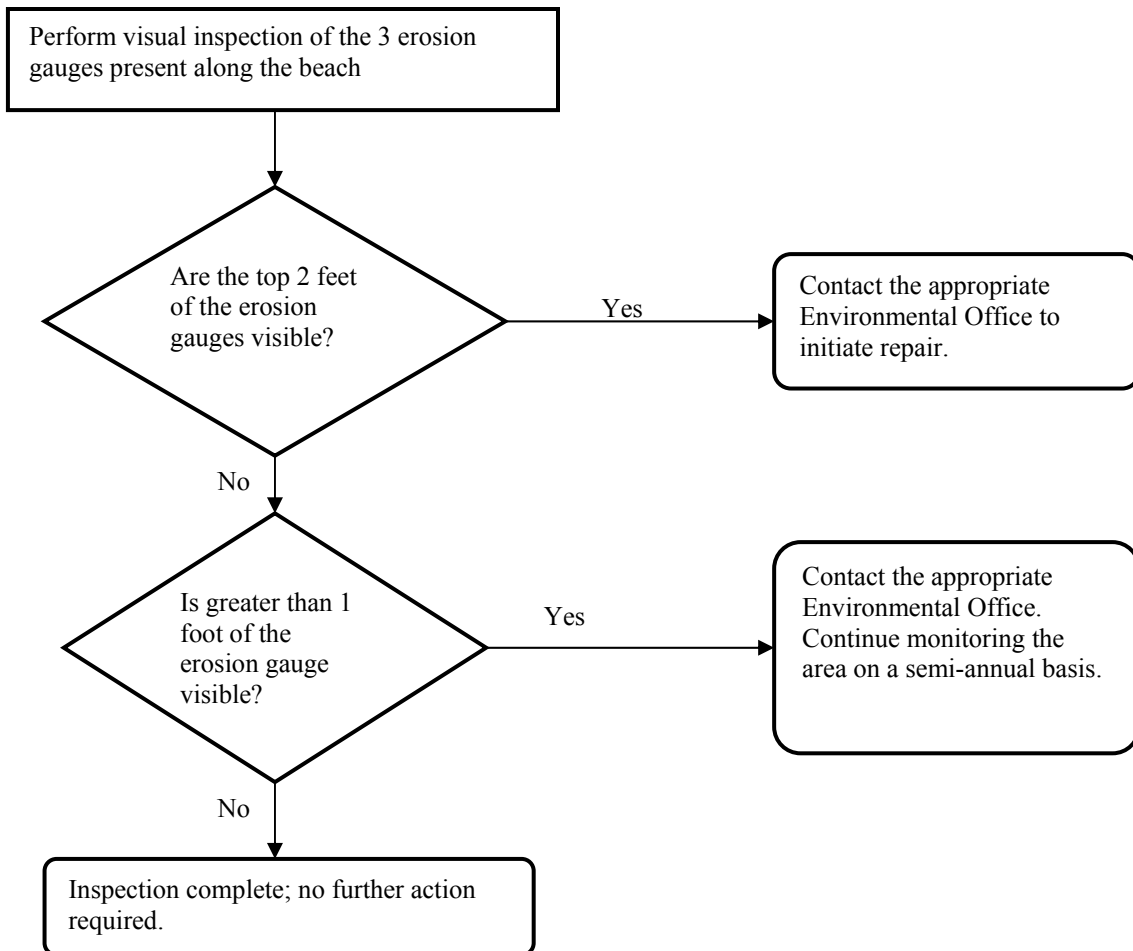


Figure 4-4. Shoreline Inspection and Maintenance Decision Diagram—Sheet Pile for Shoreline Segment 44



5. INSTITUTIONAL CONTROLS

5.1 INSPECTIONS

ICs are restrictions or administrative requirements placed on activities, access, or exposure to land, groundwater, surface water, or affected media. The ICs for the BNC are detailed in the documents listed in Table 5-1 (or most current versions).

Table 5-1. Institutional Control Requirements

Requirements	Type of IC			
	Access Control	Groundwater Restrictions	Excavation Management	Land Use Restrictions
IC Work Plan	x	x		x
Navy Physical Security - OPNAVINST 5530.14C	x			
Physical Security, Access and Movement Control at Shore Activities - NAVSEAINST 5510.2B	x			
Puget Sound Naval Shipyard Physical Security - NAVSHIPYDPUGETINST 5530.1	x			
NAVSTAINST 5530.1	x			
Outages and Excavations - NAVSTABREMERTON INSTRUCTION 11310.10D		x	x	

The objectives of the ICs are to:

- Ensure that access to the OUs at the BNC are controlled.
- Ensure that the sole use of groundwater from the BNC is for monitoring purposes.
- Ensure that excavations carried out at the BNC are managed appropriately given the contaminants left in place.
- Ensure that the established industrial use of the OUs is maintained.

The IC Work Plan (TtEC 2006) provides details on the land use restrictions (i.e., ICs) in place at BNC.

Access control involves the use of fencing and signage to control access to particular areas of the BNC. The BNC is fenced and access control signs have been installed along the BNC boundary to restrict access to official personnel only. Inspection and maintenance of

fencing and signage will ensure access to the BNC is controlled. Sign locations and types are shown on Figures 5-1 and 5-2.

Groundwater use restrictions involve restricting use of groundwater to monitoring purposes only. Inspections of groundwater use will ensure that groundwater is only used for monitoring purposes and not for potable water, equipment maintenance, or equipment decontamination. These inspections will maintain the restrictive use of groundwater at the BNC.

Excavation management involves the management of excavations to protect human health and the environment and maintain the ROD remedy. Inspections of excavations being conducted at the BNC will ensure they are conducted in a manner that protects human health and the environment. The SOP for Excavation Management is provided in Appendix C.

ICs involve maintaining the use of the BNC as an industrial facility until contaminant levels allow for unlimited use and unrestricted exposure. ICs also include future restrictions in the event of land transfer. The inspections will verify that restrictions in property development are being followed and ensure that the ROD remedy is maintained for each OU.

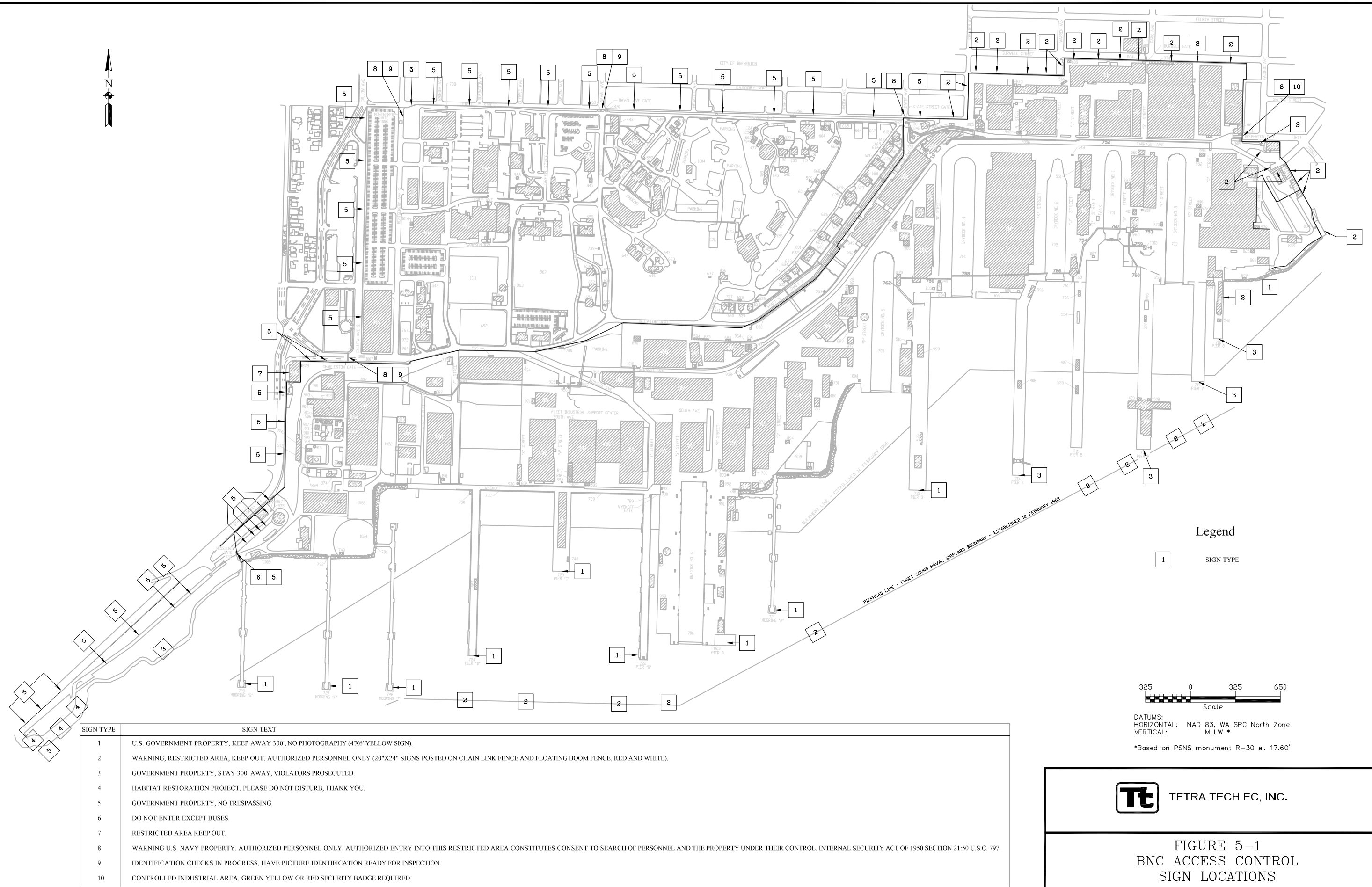
ICs also apply to OU B Marine in the identification and restriction of mooring and general access to the CAD pit located in Sinclair Inlet. The specific ICs as they apply to this area are detailed in the IC Work Plan.

Inspection and maintenance of the ICs will ensure the ROD RAO of limiting human exposure to site soils and groundwater is maintained.

A checklist detailing the inspection requirements and frequency is provided as Table 5-2. Observations will be documented on the checklists, and via photographs, if necessary.

5.2 MAINTENANCE AND REPAIRS

Figures 5-3, 5-4, 5-5, and 5-6 provide the decision diagrams for determining if repairs or upgrades to the ICs are required.





TYPE 2 SIGN



TYPE 3 SIGN



TYPE 4 SIGN



TYPE 5 SIGN



TYPE 6 SIGN



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FIGURE 5-2
BNC ACCESS CONTROL
SIGN EXAMPLES

Table 5-2. Institutional Control Inspection Checklist

Inspection Frequency/ Responsible Party	Evaluation Criteria	Inspector, Date and Time	Location of Impacted Area ^{1/}	Inspection Complete (Y/N)	Is Action Required?	Comments, Observations, Persons Notified
Every November by NAVFAC NW	Evaluate Security Trespass Report Yearly Summary provided by the Security Office for access violations or attempted access attempts. Are the Security Officers documenting the information required to evaluate exposure potential?					
Every 5 years by NAVFAC NW	Evaluate Security Trespass Report Yearly Summaries provided by the Security Office for the previous 5 years for access violations or attempted access attempts. Have access violations resulted in exposure to contaminants?					
Every November by NAVFAC NW	Perform a review of approximately 10 percent of the previous years daily security checklists to verify that damaged signs and fencing are properly documented (location and type of damage) and are repaired within the timeframe required to eliminate exposure potential. Verify that the perimeter signs depicted on Figure 5-2 and listed below are being inspected as required to eliminate exposure potential. ^{2/}					
Semi-annually by NAVFAC NW	Perform visual observation of personnel performing an excavation. Are they following the procedures established in the Excavation Management SOP (Appendix C)?					
Semi-annually by NAVFAC NW	Perform visual inspections of personnel performing excavations to see if groundwater is being used for equipment maintenance, equipment decontamination, or human consumption. If these activities are being performed, immediately contact the appropriate environmental office.					
Semi-annually by NAVFAC NW	Ask Real Estate if there is any portion of the BNC planned for transfer to a non-federal entity within the next year? If so, have EPA and Ecology been notified?					

^{1/} List nearest building number, street name, or monitor well number.

^{2/} **BNC Access Control Signage** (see Figure 5-2 showing sign locations):

Sign Type	Sign Text
1	"US Government Property, Keep Away 300', No Photography" (4' x 6' yellow sign)
2	"Warning, Restricted Area, Keep Out, Authorized Personnel Only" (20" x 24" signs posted on chain link fence and floating boom fence, red and white), see attached photograph.
3	"Government Property, Stay 300 Feet away, Violators Prosecuted", see attached photograph.
4	"Habitat Restoration Project, Please Do Not Disturb, Thank You", see attached photograph.
5	"Government Property, No Trespassing", see attached photograph.
6	"Do Not Enter Except Buses", see attached photograph.
7	"Restricted Area Keep Out"
8	"Warning U.S. Navy Property, Authorized Personnel Only, Authorized Entry into this Restricted Area Constitutes Consent to Search of Personnel and the Property Under Their Control, Internal Security Act of 1950 Section 21:50 U.S.C. 797"
9	"Identification Checks in Progress, Have Picture Identification Ready For Inspection"
10	"Controlled Industrial Area, Green Yellow or Red Security Badge Required"

Figure 5-3. Access Control Inspection and Maintenance Decision Diagram

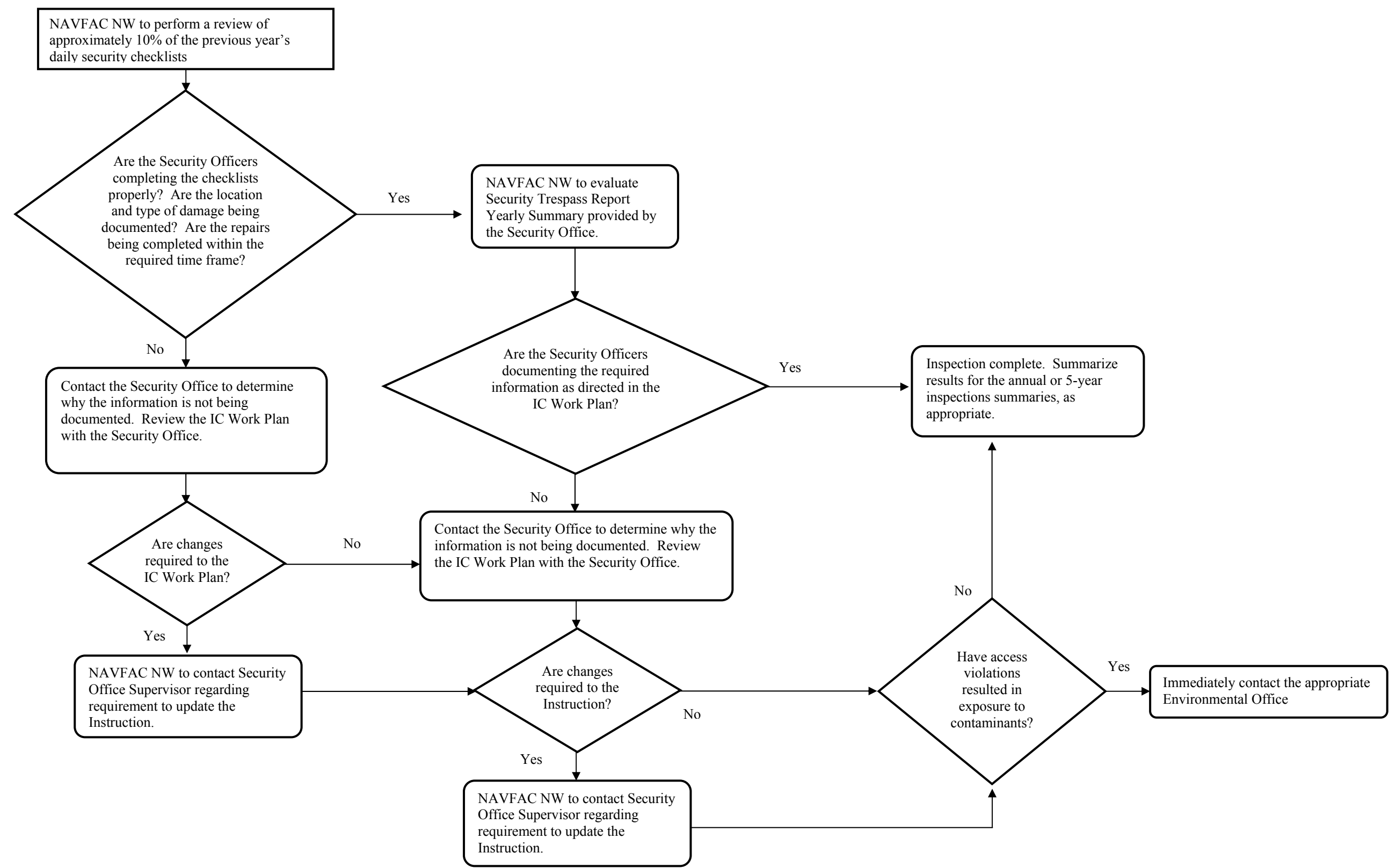


Figure 5-4. Groundwater Restrictions Inspection and Maintenance Decision Diagram

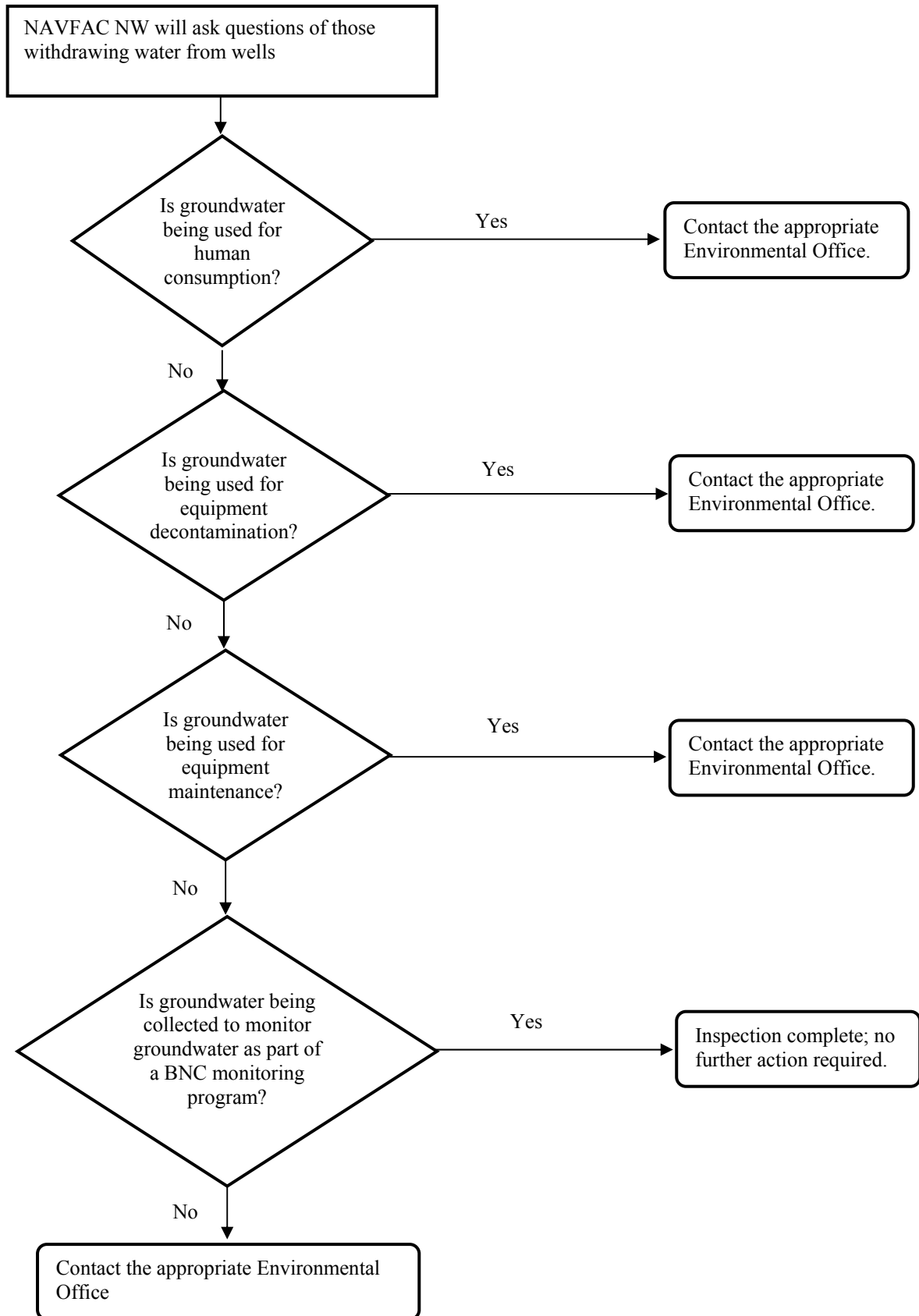


Figure 5-5. Excavation Management Inspection and Maintenance Decision Diagram

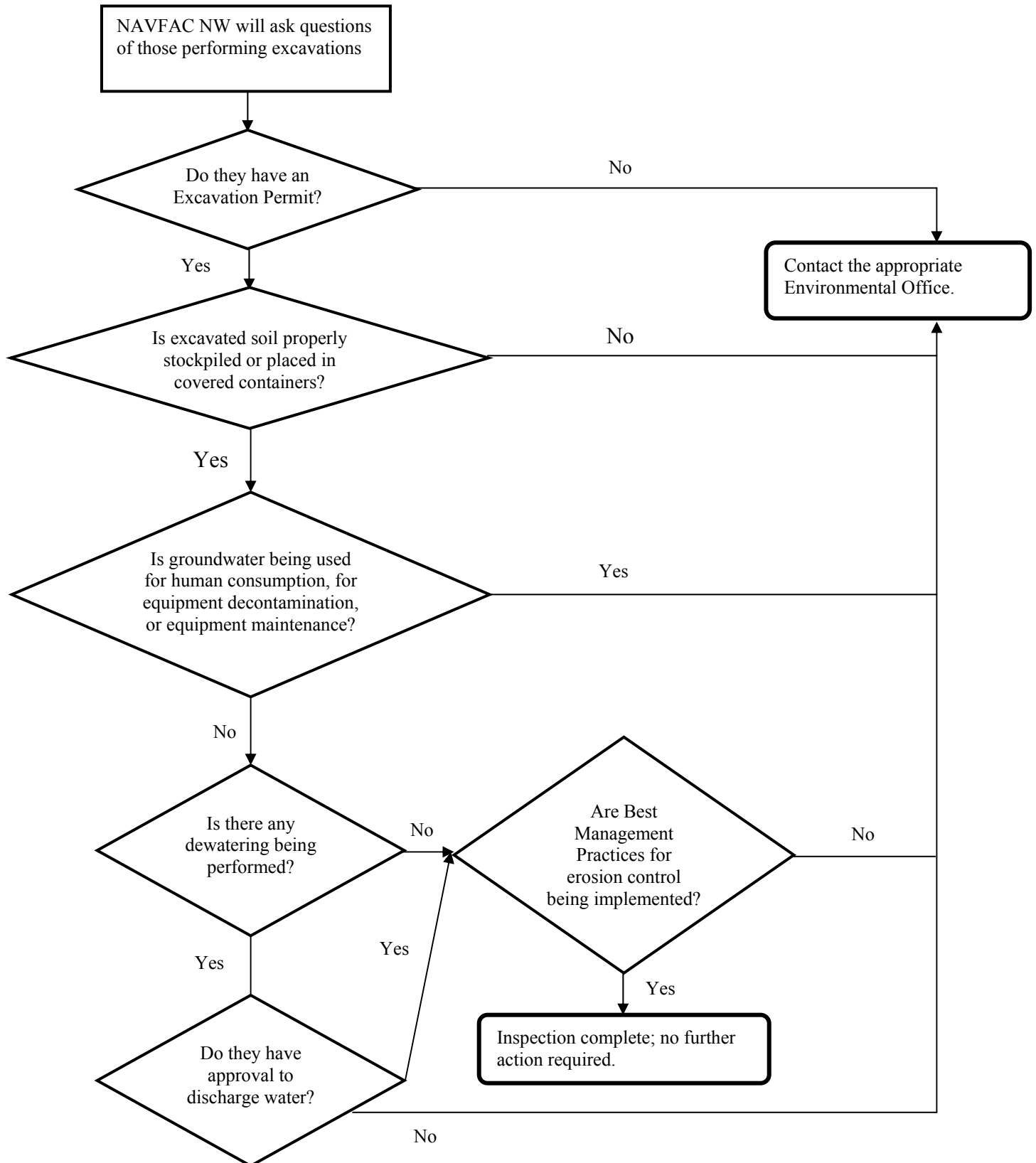
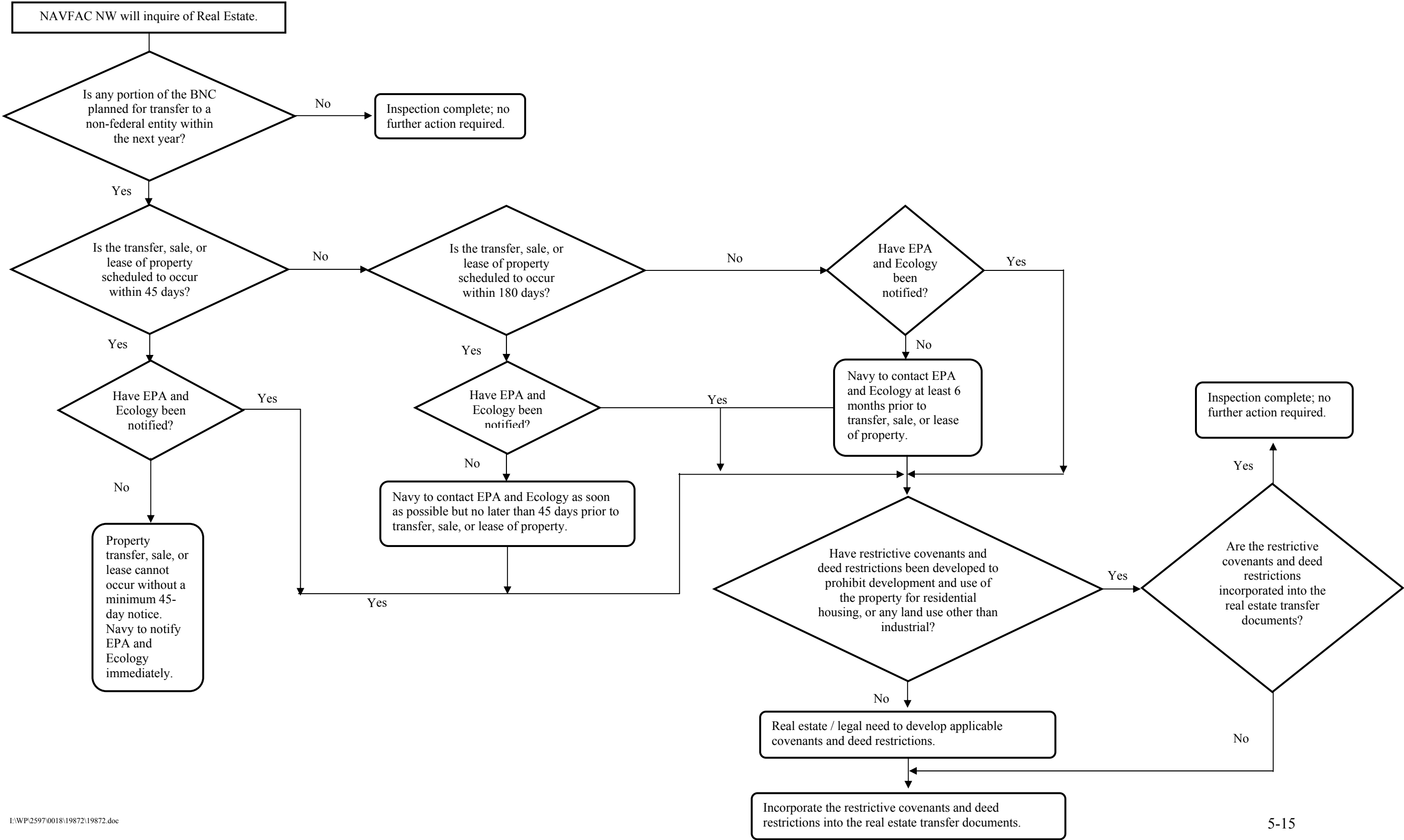


Figure 5-6. Institutional Control Inspection and Maintenance Decision Diagram



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- TtFW. 2004a. Internal Draft, Remedial Action Report, Erosion Control System, Operable Unit B Terrestrial, Phase II Remedial Action, Shoreline Protection, Bremerton Naval Complex, Bremerton, Washington. April 30, 2004.
- TtFW. 2004b. Draft Site Work Plan Supplement, Phase II Remedial OU B Terrestrial Erosion Control System – Segment 41A, Bremerton Naval Complex, Bremerton, Washington. December 28, 2004.
- U.S. Navy. 2005. Draft Final Record of Decision, OU D, Bremerton Naval Complex. January 26, 2005.
- U.S. Navy. 2004. Final Record of Decision, OU B Terrestrial, Bremerton Naval Complex. March 8, 2004.
- U.S. Navy. 2000. Final Record of Decision, BNC OU B Marine. June 13, 2000.
- U.S. Navy. 1997. Final Record of Decision, Operable Unit A, Missouri Parking Lot and Charleston Beach, Bremerton Naval Complex, Bremerton, Washington. January 29, 1997.
- U.S. Navy. 1996. Final Record of Decision, Operable Unit NSC, Fleet Industrial Supply Center, Bremerton Naval Complex, Bremerton, Washington. November 1996.

APPENDIX A

REVISIONS LOG

REVISIONS LOG

Bremerton Naval Complex Operation and Maintenance Plan

Date	Description of Revision

APPENDIX B

OU D PROPERTY TRANSFER RECORDS



DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND NORTHWEST
1101 TAUTOG CIRCLE
SILVERDALE, WASHINGTON 98315-1101

11011
05LR/NW04-022
NBK Bremerton
February 9, 2006

Mr. Gary Sexton
Director, Economic Development
City of Bremerton
239 4th Street
Bremerton, WA 98337

Dear Mr. Sexton:

Enclosed, please find the executed deed that conveys Parcels A and B to the City of Bremerton. Please have this deed recorded at your earliest convenience and return a copy of recorded deed to this office.

We look forward to working closely with you in the future conveyance of Parcels C and D.

Please contact me at 360-396-0908 if you have any questions.

Sincerely,


MICHAEL D. BRADY
Director, Real Estate Services

Enclosure

Blind Copy w/out enclosure to:
NBK PWO
PSNS (Code 980 Kevin Gross)

When Recorded Return to:

City of Bremerton
345 6th Street, 6th Floor
Bremerton, WA 98337
Attention: Gary Sexton, Director of Economic Development

Document Title: QUITCLAIM DEED

Reference Number of Document Assigned or Released: Not Applicable

Grantor's Name: THE UNITED STATES OF AMERICA

Grantee's Name: THE CITY OF BREMERTON

Abbreviated Legal Description:

Parcel A: Northernmost Parcel. A portion of Government Lot 3 of Section 24, Township 24 North, Range 1 East, W.M., City of Bremerton, Kitsap County, WA as recorded in Volume 2 of Plats, Page 30, containing 0.33 acres more or less.

Parcel B: Southernmost Parcel. A portion of Section 24, Township 24 North, Range 1 East, W.M. and Tidelands, City of Bremerton, Kitsap County, WA as recorded in Volume 2 of Plats, Page 30, containing 1.44 acres more or less.

Assessor's Property Tax Parcel Account Numbers:

QUITCLAIM DEED

This Deed is made this 9th day of February, 2006, by THE UNITED STATES OF AMERICA, acting by and through the Department of the Navy (herein called "Grantor" or "USA"), in favor of THE CITY OF BREMERTON, a municipal corporation of the State of Washington (herein called "Grantee" or "City").

RECITAL

This conveyance of property is made pursuant the authority granted in Section 2845 of Public Law 108-136; the National Defense Authorization Act of 2004, attached hereto as Exhibit "A".

CONVEYANCE

Grantor does hereby release, convey and quitclaim to Grantee, its successors and assigns, all Grantor's right, title and interest, together with all after-acquired title of the Grantor and any and all rights in abutting streets, in and to the real property and all improvements thereon and appurtenances thereto (the "Property"), located in Kitsap County, Washington and described in Exhibit "B" attached hereto and incorporated herein by this reference ("City Property"), subject to the following:

REPRESENTATIONS, COVENANTS AND RESTRICTIONS

Subject to the following Covenants, Restrictions and Conditions that shall be binding upon and enforceable against Grantee, its successors and assigns, in perpetuity, and to the following notices:

1. Grantee agrees to accept conveyance of the Property subject to all covenants, conditions, restrictions, easements, rights-of-way, reservations, rights, agreements, and encumbrances of record or not recorded.
2. A Finding of Suitability for Transfer ("FOST") has been completed and an Environmental Baseline Survey ("EBS") is referenced in the FOST. The FOST and EBS reference environmental conditions on the Property and on the other property not subject to this Deed. Grantee acknowledges that it has received copies of the EBS and the FOST; that it is aware of the notification contained therein; and that all documents referenced therein have been made available to Grantee.
3. Except as otherwise provided herein, or as otherwise provided by law, Grantee acknowledges that it has inspected, is aware of, and accepts the condition and state of repair of the Property, and that the Property is conveyed "as is" and "where is" without any representations, promise, agreement, or warranty on the part of Grantor regarding such condition and state of repair or regarding the making of any alterations,

improvements, repairs or additions. Except for the environmental remediation that may be required to be undertaken by Grantor pursuant to paragraph 5 below, Grantee further acknowledges that Grantor shall not be liable for any latent or patent defects in the Property except to the extent required by applicable law. The recording of this deed on behalf of the Grantee shall be conclusive evidence of Grantee's acceptance of both this deed, and the condition of all property conveyed hereby.

4. Asbestos Containing Materials:

A. Grantee is hereby informed and does hereby acknowledge that hazardous materials in the form of asbestos or asbestos containing materials ("ACM") have been found or are otherwise presumed to exist on the Property as disclosed and detailed in the EBS.

5. CERCLA Notices and Covenants:

A. Notices: Hazardous Substances Notification. Pursuant to 42 U.S.C. § 9620(h)(3)(A), and the provisions of 40 C.F.R. Part 373, the Grantor hereby gives notice that hazardous substances were stored for one year or more, released and disposed of on the Property. The information contained in this notice is required by regulations promulgated under Section 120(h) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9620(h). Grantor has made a complete search of the files and records concerning the Property. To the extent such information is available on the basis of said search, Grantor has disclosed and detailed in Exhibit "C" the type and quantity of such hazardous substances, the time at which such storage, release or disposal took place, to the extent that such information was available, and the remedial action taken, if any.

B. Pursuant to Section 120(h)(3)(A)(ii) of CERCLA (42 U.S.C. § 9620(h)(3)(A)(ii)) Grantor covenants and warrants that:

(1) all remedial action necessary to protect human health and the environment with respect to any hazardous substance identified pursuant to section 120(h)(3)(A)(i) of CERCLA and remaining on the Property has been taken before the date of this deed, and

(2) Any additional remedial action found to be necessary after the date of such transfer shall be conducted by the Navy. This covenant shall not apply to the extent that Grantee caused or contributed to any release or threatened release of any hazardous substance, pollutant, or contaminant.

C. Access [CERCLA 42 U.S.C. § 9620 (h)(3)(A)(iii)]. In connection with Grantor's covenant above and in connection with ongoing remediation on Grantor's property adjacent to the Property, Grantee agrees on behalf of itself, its successors and assigns, as a covenant running with the land, that Grantor, or its officers, agents, employees, contractors, and subcontractors, shall have the right, upon reasonable

notice to GRANTEE, to enter upon the Property in any case in which a response action, or corrective action is found to be necessary at such property after the date of this deed, or such access is necessary to carry out a response action, or corrective action on adjoining property. Grantee shall not have any claim on account of such entries against the Grantor or any of its agents except as may be provided by law. The Grantor shall be responsible, to the extent provided in the Federal Tort Claims Act, for any personal injury or property damage or claims, suits or penalties related to Grantor's environmental activities on the property. At the conclusion of any such entry by Grantor, Grantor shall restore the Property to the condition existing immediately prior to entry as required by applicable law.

6. Restrictive Covenant:

A. This Declaration of Restrictive Covenant is made pursuant to RCW 70.105D.030(1)(f) and (g), RCW 64.040.010 and WAC 173-340-440 by the United States Department of the Navy hereafter "Navy" and the City of Bremerton. This Declaration of Restrictive Covenant is intended to be a covenant running with the title of subject property and shall be binding on all parties and all persons claiming under them, including all future owners of any portion of or interest in the Property under principles of Washington State law.

B. The property that is the subject of this Restrictive Covenant is Operable Unit D, at Naval Base Kitsap-Bremerton (NBK Bremerton) and has been the subject of a remedial actions under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. 9601, *et seq.* and Executive Order 12580. The Navy, US Environmental Protection Agency and State of Washington Department of Ecology signed a Record of Decision for OU D in April of 2005 at NBK Bremerton. The applicable components of the selected remedies for the conveyed portion OU D are: Vegetated Cap, Groundwater Monitoring, Shoreline Protection, and Institutional Controls. The Remedial Actions conducted at the property are described fully in the Final Record of Decision for Operable Unit D that is on file at US EPA, 1200 Sixth Avenue, Seattle, WA.

C. This Restrictive Covenant is required because soil contained under the vegetated cap in OU-D exceeds MTCA Method B for the protection of surface water.

D. Navy as holder of legal title does hereby declare that it has authority to enter into this Restrictive Covenant. Navy makes the following declarations as to limitations, restrictions, and uses to which the property may be put. Furthermore, it is the intent of the Navy that such declarations shall constitute covenants and/or equitable servitude that run with the land, as provided by law, and be binding on all parties and all persons claiming under them, including future owners of any portion of or interest in the property.

(1) Except as otherwise provided for in this Restrictive Covenant the Owner shall not:

(a) Use the Property for any uses other than recreational. Recreational use is defined as walking, viewing, nature watching, playing, entertainment, festivals, markets, concerts, museum and park food services, social activities, museum use and related activities, movies, picnicking, exercising, relaxing and all other activities reasonably associated with park, museum, and public open space usage.

(b) Take or use groundwater for any purpose except monitoring.

(c) Engage in any activity on the Property that may result in the release or exposure to the environment of the contaminated soil that was contained as part of the Remedial Action for OU-D, or create a new exposure pathway. Some examples of activities that are prohibited in the capped areas include: drilling, digging, place any objects or use of any equipment which deforms or stresses the surface beyond its load bearing capability, piercing the surface with a rod, spike or similar item, bulldozing or earthwork.

(2) Notwithstanding any other provision of this Restrictive Covenant, Owner may engage in activities on the Property that may interfere with the Remedial Action, operation and maintenance, or monitoring provided that it obtains the prior written approval of the Environmental Protection Agency, Region X (EPA) and Washington Department of Ecology (WDOE). The Owner shall provide Navy with a copy of the written approvals.

(3) In conducting construction activities on the property the Owner shall comply with the requirements set forth in Exhibit "D".

(4) The Owner shall notify the US Navy, WDOE, and EPA, or its successor agency, before any use of the Property that is inconsistent with the terms of this Restrictive Covenant.

(5) The Owner shall allow authorized representatives of the US Navy, WDOE, and EPA, and/or its successor agency, the right to enter the Property at reasonable times for the purpose of evaluating compliance with the Restrictive Covenant, and other required plans, including the right to take samples.

(6) The Owner shall restrict leases of the Property to uses and activities consistent with this Restrictive Covenant and shall notify all lessees of the restrictions on the use of the Property.

(7) Conformed copies of the recorded Quitclaim Deed shall be forwarded to EPA, Region 10, Office of Regional Counsel, 1200 Sixth Avenue, ORC-158, Seattle, WA. The Owner shall include notice of this Restrictive Covenant in any instrument conveying any interest in any portion of the Property.

(8) The Owner of the Property reserves the right under WAC 173-340-440 to record an instrument that provides that this Restrictive Covenant shall no longer limit the use of the Property or be of any further force or effect provided that the US Navy, EPA and WDOE have determined in writing that the restrictive covenant is no longer required to protect human health and the environment or otherwise to comply with an Applicable, Relevant and Appropriate Requirements (ARAR).

(9) The Owner hereby confirms that this Restrictive Covenant is enforceable at law by the US Navy, EPA, and WDOE, all of whom shall be considered third party beneficiaries of this Restrictive Covenant.

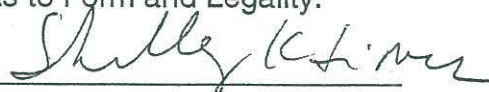
7. In the event that the conveyance of Parcel C fails to materialize for any reason, title to Parcels A and B, conveyed herein, shall revert to the Grantor free of any cost or obligation whatsoever.

8. GRANTEE COVENANTS for itself, its heir, successors, and assigns and every successor in interest to the property hereby conveyed, or any part thereof, that the said Grantee and such heirs, successors, and assigns shall not discriminate upon the basis of race, color, religion, or national origin in the practices conducted thereon. This covenant shall not apply, however, to the lease or rental of a room or rooms within a family dwelling unit; nor shall it apply with respect to religion to premises used primarily for religious purposes. The United States of America shall be deemed a beneficiary of this covenant without regard to whether it remains the owner of any land or interest therein in the locality of the property hereby conveyed and shall have the sole right to enforce this covenant in any court of competent jurisdiction.

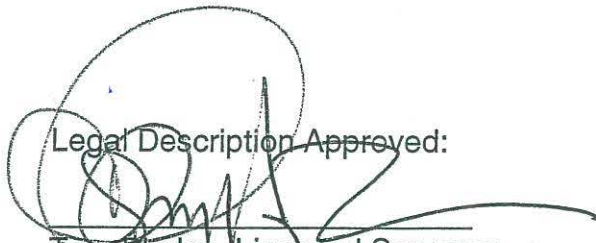
GRANTOR:
UNITED STATES OF AMERICA

By 
MICHAEL D. BRADY
Real Estate Contracting Officer
Naval Facilities Engineering Command Northwest

Reviewed and Approved
As to Form and Legality:


Shelley K. Simcox
Counsel

Legal Description Approved:


Tom Phelps, Licensed Surveyor

EXHIBITS

Exhibit "A" – Public Law 108-136, Section 8143, Department of Defense Appropriation Act of 1999

Exhibit "B" – Legal Description of City Property (Parcels A, and B)

Exhibit "C" – CERCLA 12(h) Notice

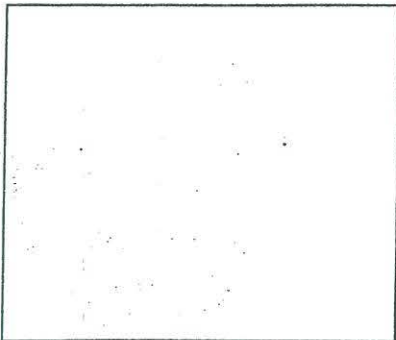
Exhibit "D" – Construction Requirements

STATE OF WASHINGTON)
COUNTY OF KITSAP) ss.
)

On this 9th day of February 2006, before me personally appeared Michael D. Brady, known or identified to me to be the authorized agent of the United States of America, the governmental entity that executed the instrument or the person who executed the instrument on behalf of said governmental entity, and acknowledged to me that such governmental entity executed the same.

WITNESS my hand and official seal hereto affixed the day and year in this certificate above written.

Date: February 9, 2006



Use this space for Notary Seal/Stamp

Charles W Van C
NOTARY PUBLIC in and for the State of
Washington residing at Poulsbo, WA
My commission expires: March 9, 2009
PRINT NAME: Charles W. Van Cleave

EXHIBIT "A"

SEC. 2828. LAND CONVEYANCE, PUGET SOUND NAVAL SHIPYARD, BREMERTON, WASHINGTON.

(a) **CONVEYANCE AUTHORIZED-** The Secretary of the Navy may convey to the City of Bremerton, Washington (in this section referred to as the `City'), all right, title, and interest of the United States in and to a parcel of real property, including any improvements thereon, consisting of approximately 2.8 acres at the eastern end of the Puget Sound Naval Shipyard, Bremerton, Washington, immediately adjacent to the Bremerton Transportation Center.

(b) **CONSIDERATION-** As consideration for the conveyance under subsection (a), the City, directly or through an agreement with another entity, shall replace administrative space on the parcel to be conveyed by renovating for new occupancy approximately 7,500 square feet of existing space in Building 433 at Naval Station, Bremerton, Washington, at no cost to the United States, in accordance with plans and specifications acceptable to the Secretary. In lieu of any portion of such renovation, the Secretary may accept other facility alteration or repair of not less than equal value.

(c) **PAYMENT OF COSTS OF CONVEYANCE-** (1) The Secretary shall require the City to cover costs to be incurred by the Secretary, or to reimburse the Secretary for costs incurred by the Secretary, to carry out the conveyance under subsection (a), including survey costs, costs related to environmental documentation, and other administrative costs related to the conveyance. If amounts are collected from the City in advance of the Secretary incurring the actual costs, and the amount collected exceeds the costs actually incurred by the Secretary to carry out the conveyance, the Secretary shall refund the excess amount to the City.

(2) Amounts received as reimbursement under paragraph (1) shall be credited to the fund or account that was used to cover the costs incurred by the Secretary in carrying out the conveyance. Amounts so credited shall be merged with amounts in such fund or account, and shall be available for the same purposes, and subject to the same conditions and limitations, as amounts in such fund or account.

(d) **ENVIRONMENTAL CONDITIONS-** The Secretary may use funds available in the Environmental Restoration Account, Navy to carry out the environmental remediation of the real property to be conveyed under subsection (a). Such environmental remediation shall be conducted in a manner consistent with section 120 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. 9620), including the requirement to consider the anticipated future land use of the parcel.

(e) **EXEMPTION FROM FEDERAL SCREENING-** The conveyance authorized by subsection (a) is exempt from the requirement to screen the property for other Federal use pursuant to sections 2693 and 2696 of title 10, United States Code.

(f) **DESCRIPTION OF PROPERTY-** The exact acreage and legal description of the real property to be conveyed under subsection (a) shall be determined by a survey satisfactory to the Secretary.

EXHIBIT "A"

(g) **ADDITIONAL TERMS AND CONDITIONS-** The Secretary may require such additional terms and conditions in connection with the conveyance under subsection (a) as the Secretary considers appropriate to protect the interests of the United States.

EXHIBIT B PARCEL A



SCALE IN FEET
1" = 50'

BLOCK 12

PACIFIC AVENUE

N01°35'20"E

274.01'(M) 275'(PLAT)

SECOND STREET

LINE TABLE		
LINE	BEARING	LENGTH
L1	S01°35'20"W	87.24'
L2	N29°14'24"W	44.17'
L3	S60°46'07"W	96.34'
L4	N61°57'00"W	43.68'
L5	S01°35'20"W	21.11'

BLOCK 9

FD 3" BRASS DISC
W/X' IN MON CASE

FIRST STREET

N88°24'32"W
149.00'(C, PLAT)

S88°24'32"E 329.63'(M) 329.74'(TIDE)
149.02'(M) 149'(PLAT)

FD 3" SURFACE
BRASSIE STAMPED
"WSF PAGE 23612"

S01°36'57"W
35.00'

S88°24'32"E

135.00'(C, PLAT)
211.01'

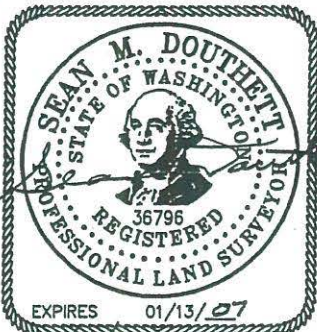
P.O.B.

PARCEL
A

14,581 SQUARE FEET, 0.33 ACRES
MORE OR LESS

BLOCK 10

FD 3" BRASS DISC
STAMPED "PSNS2
1994 LS15661" 0.3'
DOWN IN MON CASE



EXPIRES 01/13/07

01/31/2006

CURVE TABLE			
CURVE	DELTA	RADIUS	LENGTH
C1	63°32'46"	67.00'	74.31'
C2	13°26'40"	150.00'	35.20'



DAVID EVANS
AND ASSOCIATES INC.

3700 Pacific Hwy. East, Suite 311
Tacoma Washington 98424
Phone: 253.922.9780

P:\E\Exe\0000-0009\0300cadd\330svd\dwg\Exe\0000-0009 A-D-EXHIBIT.dwg 01-31-06

PARCEL A

THAT PORTION OF THE PLAT OF "TOWN OF BREMERTON", RECORDED IN VOLUME 2 OF PLATS, PAGE 30, SITUATE WITHIN GOVERNMENT LOT 3 OF SECTION 24, TOWNSHIP 24 NORTH, RANGE 1 EAST, W.M., CITY OF BREMERTON, KITSAP COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS;

COMMENCING AT A CASED MONUMENT AT THE INTERSECTION OF FIRST STREET AND PACIFIC AVENUE;

THENCE SOUTH $88^{\circ}24'32''$ EAST ALONG THE CENTERLINE OF SAID FIRST STREET 149.02 FEET TO A BRASS MONUMENT;

THENCE SOUTH $01^{\circ}36'57''$ WEST 35.00 FEET TO THE SOUTHERLY RIGHT-OF-WAY MARGIN OF SAID FIRST STREET;

THENCE NORTH $88^{\circ}24'32''$ WEST ALONG SAID SOUTHERLY RIGHT-OF-WAY MARGIN 14.00 FEET TO THE WESTERLY LINE OF THE ALLEY IN BLOCK 10 OF SAID PLAT AND THE POINT OF BEGINNING;

THENCE SOUTH $01^{\circ}35'20''$ WEST ALONG SAID WESTERLY LINE 87.24 FEET;

THENCE NORTH $29^{\circ}14'24''$ WEST 44.17 FEET;

THENCE SOUTH $60^{\circ}46'07''$ WEST 96.34 FEET TO THE BEGINNING OF A NON-TANGENT CURVE CONCAVE TO THE SOUTHWEST FROM WHENCE ITS CENTER BEARS SOUTH $41^{\circ}29'40''$ WEST 150.00 FEET DISTANT;

THENCE NORTHWESTERLY ALONG THE ARC OF SAID CURVE 35.20 FEET THROUGH A CENTRAL ANGLE OF $13^{\circ}26'40''$;

THENCE NORTH $61^{\circ}57'00''$ WEST 43.68 FEET TO THE BEGINNING OF A CURVE CONCAVE TO THE NORTHEAST FROM WHENCE ITS CENTER BEARS NORTH $28^{\circ}03'00''$ EAST 67.00 FEET DISTANT;

THENCE NORTHERLY ALONG THE ARC OF SAID CURVE 74.31 FEET THROUGH A CENTRAL ANGLE OF $63^{\circ}32'46''$ TO THE SOUTHERLY RIGHT-OF-WAY MARGIN OF SAID FIRST STREET;

THENCE SOUTH $88^{\circ}24'32''$ EAST ALONG SAID SOUTHERLY MARGIN 211.01 FEET TO THE POINT OF BEGINNING.

CONTAINING 14,581 SQUARE FEET OR 0.33 ACRES, MORE OR LESS.

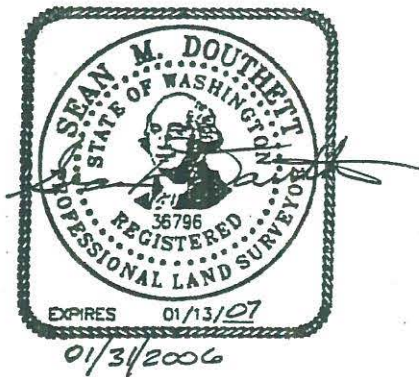
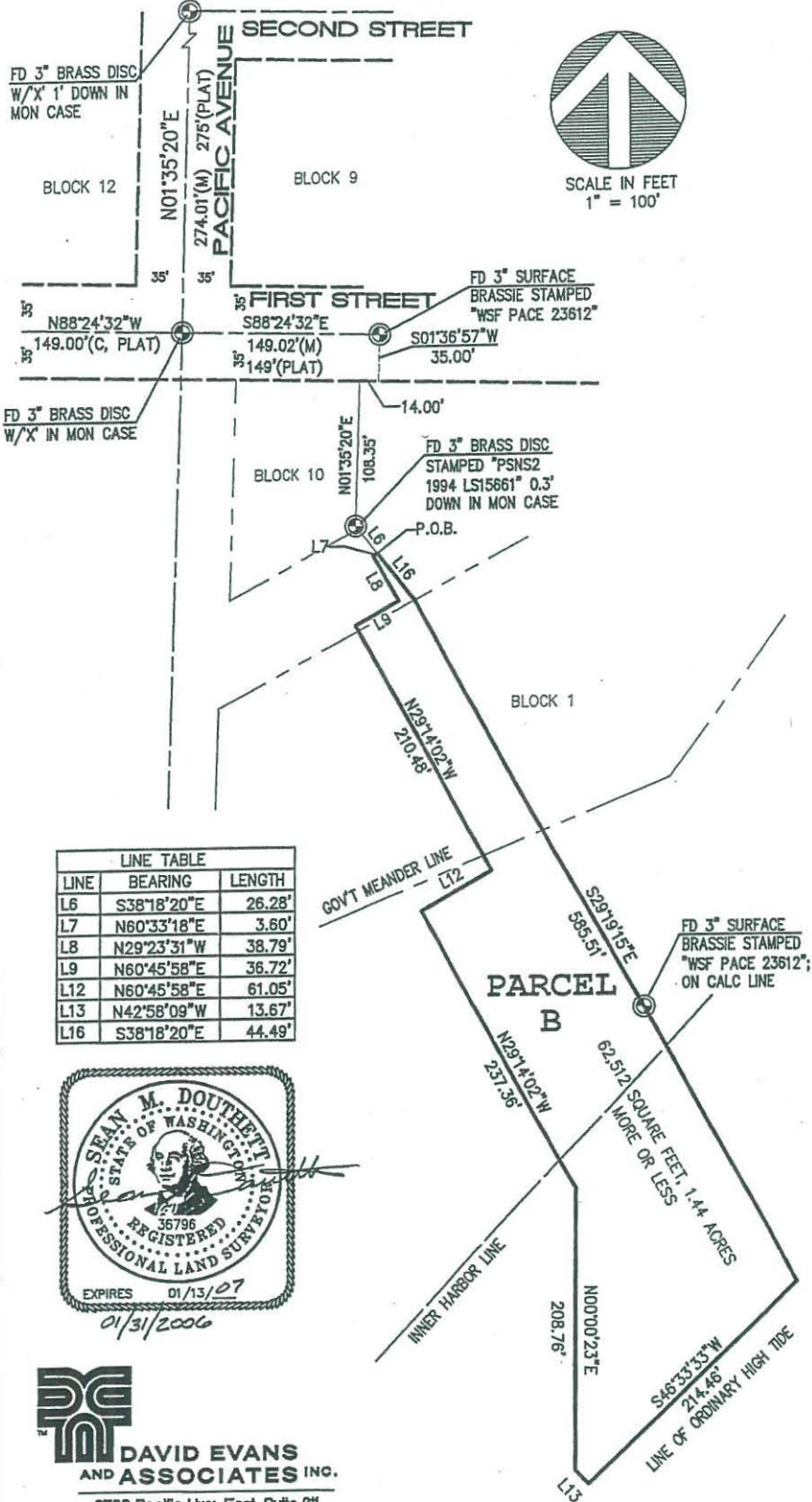


EXHIBIT B PARCEL B



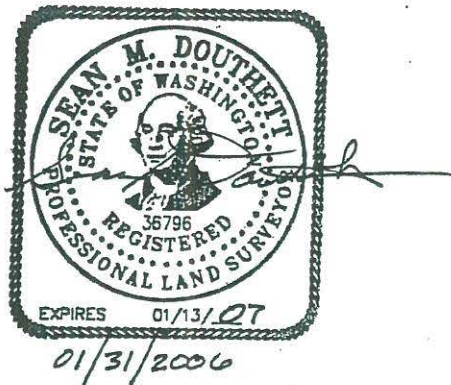
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PARCEL B

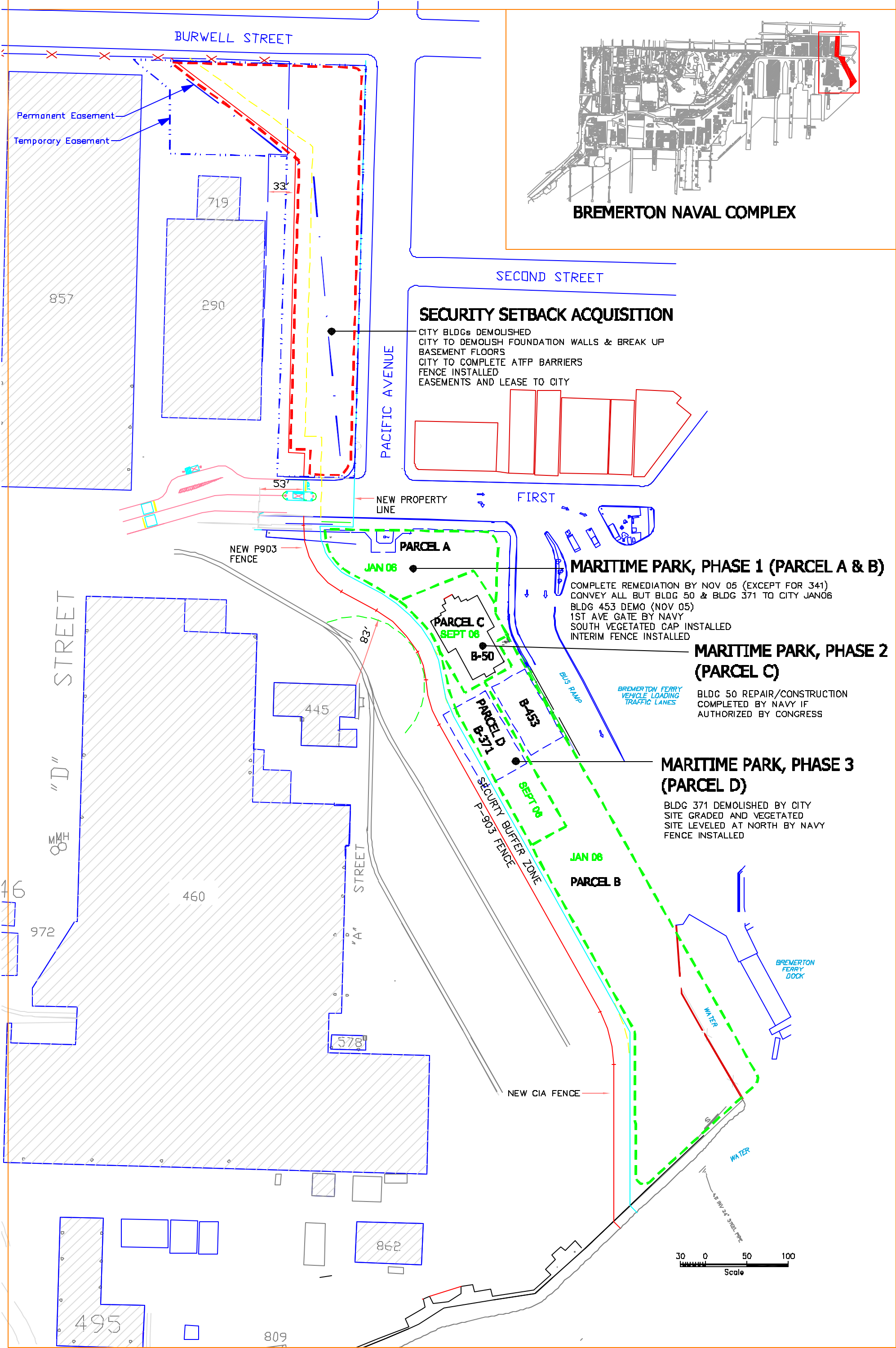
PORTIONS OF THE PLAT OF "TOWN OF BREMERTON", RECORDED IN VOLUME 2 OF PLATS, PAGE 30, GOVERNMENT LOT 3 SECTION 24, TOWNSHIP 24 NORTH, RANGE 1 EAST, W.M., AND TIDELANDS SITUATE WITHIN THE CITY OF BREMERTON, KITSAP COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS;

COMMENCING AT A CASED MONUMENT AT THE INTERSECTION OF FIRST STREET AND PACIFIC AVENUE;
THENCE SOUTH 88°24'32" EAST ALONG THE CENTERLINE OF SAID FIRST STREET 149.02 FEET TO A BRASS MONUMENT;
THENCE SOUTH 01°36'57" WEST 35.00 FEET TO THE SOUTHERLY RIGHT-OF-WAY MARGIN OF SAID FIRST STREET;
THENCE NORTH 88°24'32" WEST ALONG SAID SOUTHERLY MARGIN 14.00 FEET TO THE WESTERLY LINE OF THE ALLEY IN BLOCK 10 OF SAID PLAT;
THENCE SOUTH 01°35'20" WEST ALONG SAID WESTERLY LINE 108.35 FEET TO A BRASS MONUMENT STAMPED PSNS2;
THENCE SOUTH 38°18'20" EAST 26.28 FEET TO THE POINT OF BEGINNING;
THENCE CONTINUING SOUTH 38°18'20" EAST 44.49 FEET;
THENCE SOUTH 29°19'15" EAST 585.51 FEET TO THE LINE OF ORDINARY HIGH TIDE;
THENCE SOUTH 46°33'33" WEST ALONG SAID LINE OF ORDINARY HIGH TIDE 214.46 FEET;
THENCE NORTH 42°58'09" WEST 13.67 FEET;
THENCE NORTH 00°00'23" EAST 208.76 FEET;
THENCE NORTH 29°14'02" WEST 237.36 FEET;
THENCE NORTH 60°45'58" EAST 61.05 FEET;
THENCE NORTH 29°14'02" WEST 210.48 FEET;
THENCE NORTH 60°45'58" EAST 36.72 FEET;
THENCE NORTH 29°23'31" WEST 38.79 FEET;
THENCE NORTH 60°33'18" EAST 3.60 FEET TO THE POINT OF BEGINNING.

CONTAINING 62,512 SQUARE FEET OR 1.44 ACRES, MORE OR LESS.



EAST END TRANSITION PLAN



APPENDIX C

STANDARD OPERATING PROCEDURE

EXCAVATION MANAGEMENT

AT BREMERTON NAVAL COMPLEX

STANDARD OPERATING PROCEDURE

EXCAVATION MANAGEMENT AT BREMERTON NAVAL COMPLEX

Revised February 28, 2006

PURPOSE. The purpose of this Standard Operation Procedure (SOP) is to establish procedures for contractors and Bremerton naval complex (BNC) employees to protect human health and the environment when excavation is necessary during new construction or routine maintenance of facilities within the BNC. The BNC encompasses Naval Base Kitsap (NBK) at Bremerton and the Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF).

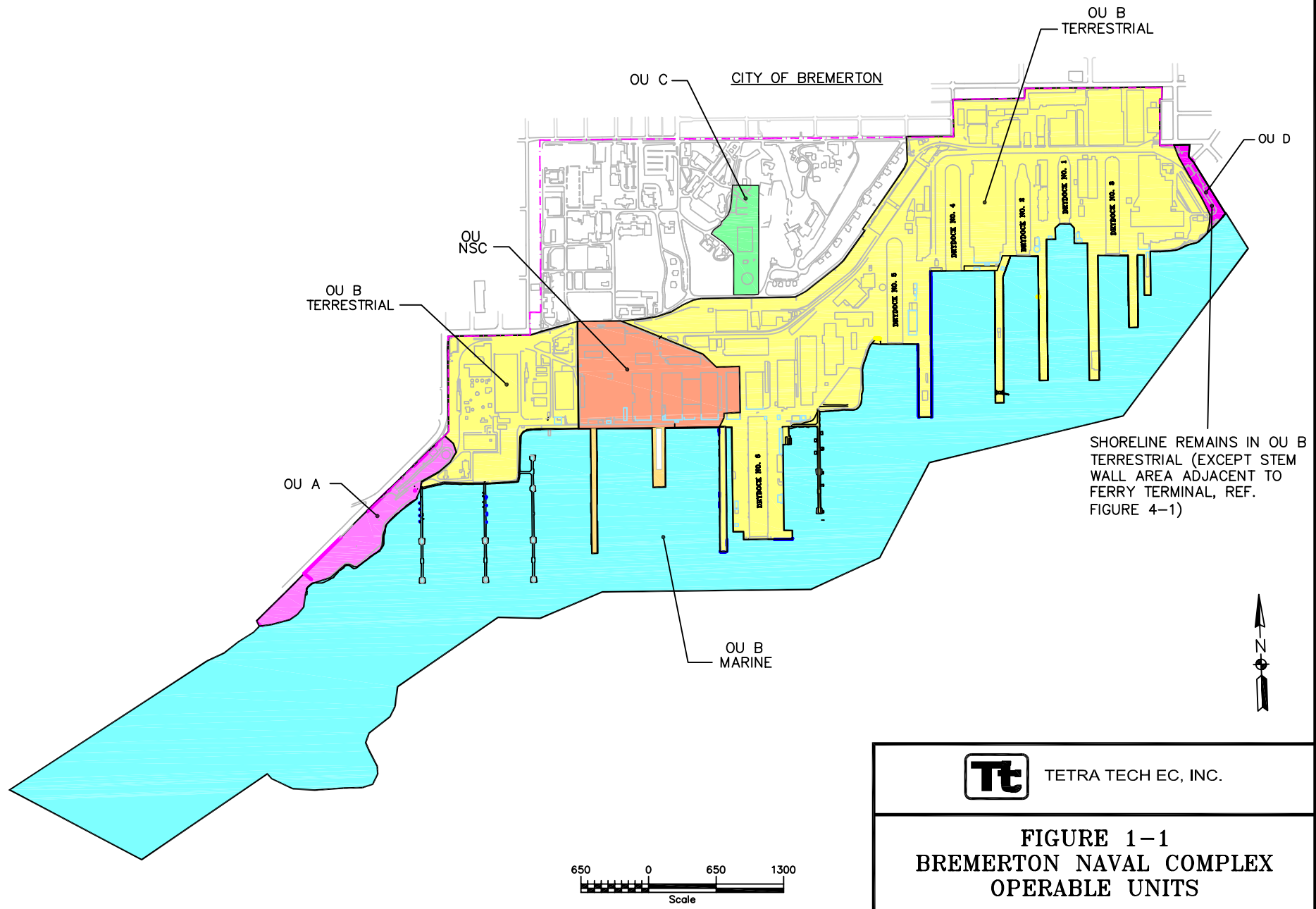
SCOPE. This SOP provides guidance for all excavation activities at the BNC and applies to all military, civil service, and contractor personnel conducting such activities.

BACKGROUND. The BNC was established over 100 years ago. Disposal practices that were considered acceptable in the past resulted in areas with contaminated soil and groundwater. The BNC was listed on the National Priorities List (NPL) by the U.S. Environmental Protection Agency (EPA) in May 1994, and is managed under the Navy's Installation Restoration (IR) Program, similar to the Superfund Clean-Up Program. Based on this listing, the BNC was divided into several Operable Units (OUs), including OU A, OU B, OU C, OU D, and OU NSC (Figure 1-1). While it is possible to uncover unexpected items during any earth-moving or excavation project, project workers need to be especially aware of this possibility when they are working in an OU.

Ongoing Navy operations at the BNC will inevitably require soil excavation in connection with new construction and maintenance of existing facilities. These excavations will breach the pavement and vegetation that cap the site, and create the potential to temporarily expose workers to contaminants, through skin contact or airborne respiratory particles. This instruction was developed to assist in controlling the human health risks and to provide procedures for the proper management (accumulation and disposal) of soil.

NATURE AND EXTENT OF CONTAMINATION. Soils from many areas within the BNC can be expected to contain some level of total petroleum hydrocarbons (TPHs), carcinogenic polycyclic aromatic hydrocarbons (cPAHs), and elevated levels of inorganics.

The TPHs of concern include all fractions (motor oil, diesel, gasoline, and total). The cPAHs of concern include benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene. The inorganics of concern include arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, silver, thallium, and zinc. Some sites also have semi-volatile organic compounds (SVOCs), pesticides, or polychlorinated biphenyls (PCBs) at concentrations of concern. The presence and concentration of contamination within each site is dependent on location and depth. Detailed information on



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**FIGURE 1-1
BREMERTON NAVAL COMPLEX
OPERABLE UNITS**

contaminants and concentrations are available in the local libraries or in the environmental offices at the BNC.

During the planning phases of the project, the organization performing the excavation will need to review the existing soil and groundwater data. Contractors will need to work through their Contracting Officer and government employees will need to contact the appropriate Environmental Office. Review of the existing data will allow those personnel doing the excavation to assess their needs for worker protection and the possible need for additional sampling. It may be determined that available data are insufficient for making a decision on worker protection. If during the course of the project, unique or questionable conditions are uncovered (e.g., stained soil, strong odor, bones of any kind, and shell fragments), that portion of work will be stopped and the emergency response procedures followed.

PRE-EXCAVATION PROCEDURES. Before the start of any excavation, an excavation permit (see NAVSTABREMERTON INSTRUCTION 11310.10D or most recent) must be obtained. Contractors will need to work through their Contracting Officer in submitting an excavation permit request. Government employees need to work through their supervisor to contact the cognizant activity. Also, prior to excavation, the location of utilities will need to be verified as described in Instruction 11310.10D. The Naval Base Kitsap, Bremerton Site, Public Works, Code N441 maintains the drawings (including subsurface) for the BNC. They are located in Building 448. All personnel, including contractors, have access to the drawings and reproduction machines are available for use. If extensive copies are needed, funding must be provided and the job sent to Defense Printing. A person is on site to provide a brief orientation on how to locate drawings and make copies.

Other permits/outage requests may also be needed for the project (see Instruction 11310.10D).

EXCAVATION PROCEDURES. Projects involving excavation must implement the proper measures or Best Management Practices (BMPs) that will eliminate or reduce human exposure and pollutant loading from exposed soil and stormwater discharges from a site. A few examples of BMPs that are applicable to excavations are listed below. For more information regarding BMPs, consult the following publications: *PSNS's Water Pollution Prevention Plan and Control Plan (NAVSHIPYDPUGETINST P5090.30A)*; *Washington State Stormwater Management Manual for Western Washington*; and *EPA's Stormwater Management for Construction Activities, Developing Pollution Prevention Plan, and Best Management Practices, Document #832-R-92-005*.

GOOD HOUSEKEEPING. Good housekeeping prevents dirt, surplus material, solid waste, and dropped materials from being transported by runoff when it rains. Minimum BMPs for work site cleanup include weekly inspections as well as personnel and equipment decontamination.

SOIL CONTROL AND MANAGEMENT. Regardless of where soil is being excavated, the following guidance applies for reusable and non-reusable soil at the same work site, unless otherwise approved. Contractors need to obtain approval through their Contracting Officer; government employees obtain approval through their Environmental Office.

Soil that is reusable at the same worksite should be accumulated within the same area as the excavation from which it was removed, preferably as near to the excavation as practicable. A storage area should be created in the following manner:

- Underlay the soil accumulation area with a continuous impervious sheet of plastic. Protect the plastic from perforation during loading and handling operations. The thickness of the plastic shall be sufficient to contain the soil, and in no case be less than 10 mil. Thicker or reinforced plastic, or other measures, to protect the integrity of the plastic underlayment may be required if there is danger that the plastic will be punctured or torn during soil accumulation. If it is necessary to join two or more sheets of plastic to cover the pile, all seams shall be welded, heat sealed, or taped continuously on both sides of the sheet.
- Install a berm around the pile so that soil remains in the designated area. The edges of the underlayment must be laid over the top of the berm and secured to prevent water from running under the soil pile.
- Install an impervious continuous sheet of plastic, 10-mil minimum thickness, over the pile and over the outside of the berm so that rainwater is directed away from the soil inside the berm. If it is necessary to join two or more sheets of plastic to cover the pile, all seams shall be welded, heat sealed, or taped continuously on both sides of the sheet.
- Secure the top cover sheet to ensure that wind will not balloon the cover or blow it aside leaving the soil exposed to weather.
- Keep the soil pile covered and secured at all times except when actually adding or removing soil or taking samples.

Soil may not be reusable at the same worksite due to compaction, excavation needs, or other reasons. If this is the case, the soil is considered a waste and must be handled appropriately. BNC approval is required before stockpiling soil. Contractors need to check with their Contracting Officer and BNC employees will need to check with their Environmental Office to see if it can be used somewhere else at the BNC or will need to be disposed off site.

SEDIMENT AND EROSION CONTROL. Excavation activities remove the protective ground cover at a site, resulting in the exposure of underlying soil to wind and rain. BMPs for erosion and sediment control must be established prior to excavation. Some of the BMPs for erosion control that apply to excavations are minimizing the length of time soil is exposed, installing silt fences, and protecting storm drain inlets.

MONITORING WELL PROTECTION. The integrity of monitoring wells in any excavation area must be ensured. The entity performing the excavation shall inspect the area for monitoring wells prior to initiation of excavation activities. Security of the wells such that silt or debris do not enter the monitoring wells is required. In the event that a well is damaged or is within the footprint of the area to be excavated, Naval Facilities Engineering Command Northwest (NAVFAC NW) must be notified so that the well can be repaired, relocated, or replaced, if required.

UNEXPECTED CONTAMINATION. During excavation (or any digging or trenching operations), inspect the worksite for objects or obvious signs of unexpected contamination (e.g., cement asbestos pipe, insulation, cans, drums, stained soil, or strong odors). When obvious signs of unexpected contamination are found, immediately dial NESCOM at 911 if dialing from a BNC telephone, from a non-BNC or cellular telephone dial 360-476-2222. NESCOM should also be called if unearthing creates an immediate threat to human health or the environment. Report it as a spill to the NESCOM operator, then notify the supervisor, or if a contractor, the Contracting Officer. If there is any uncertainty, or for questionable items or signs of contamination, immediately notify the supervisor, or if a contractor, notify the Contracting Officer.

DEWATERING. Excavations may collect water either from stormwater or groundwater infiltration. Dewatering of excavations on BNC property is a complex activity because some areas are contaminated and special requirements apply. The BNC has developed procedures for dewatering at the BNC, which has been agreed upon with the Washington State Department of Ecology. The process is different depending on the location. Contractors will need to refer to the dewatering procedures and work through their Contracting Officer for further direction if dewatering is anticipated. Government employees will need to work through their supervisor to contact the cognizant activity.

STORMWATER AND WASTEWATER MANAGEMENT. During excavation activities, stormwater and wastewater must be managed to prevent or reduce water pollution. Each job site must implement appropriate BMPs to direct stormwater away from excavations. Wastewater may not be discharged into the BNC storm drains unless authorized by the BNC.

EXCAVATION SAFETY. The Site-Specific Health and Safety Plan developed for government personnel or the contractor's health and safety plan must be followed for excavation personnel safety. The plan should address, but is not limited to, shoring, benching, cave-ins, hazardous atmospheres, running water, and falling objects. A complete discussion of excavation safety is available in Section 25 of the U.S. Army Corps of Engineers *Safety and Health Requirements Manual EM 385-1-1*.

INSTITUTIONAL CONTROLS OF GROUNDWATER. Groundwater at excavation sites may not be withdrawn for human consumption, equipment maintenance, or equipment decontamination. Groundwater use is restricted to monitoring purposes only. A complete discussion of the ICs for groundwater is provided in the IC Work Plan.

SPILL RESPONSE ACTIONS. PSNS & IMF provides spill response for the BNC and has specific spill response actions, which must be initiated to provide for immediate response. This prevents hazardous substances from reaching navigable waters and ensures that proper actions are taken when a spill has occurred. The purpose of the PSNS's Oil & Hazardous Substance (OHS) Spill Contingency Plan is to ensure that government response actions are initiated immediately to minimize adverse effects to human health and the environment resulting from emergency spill events.

POST-EXCAVATION PROCEDURES. The existing site paving, vegetation, and shoreline protection systems limit direct human contact with soil and control migration of site contaminants due to infiltration and erosion. Excavation activities cause a breach of the cap, so it is important to provide a new cap as soon as possible.

A cap is a horizontal barrier that minimizes surface water from seeping into the soil. It also prevents human exposure to the contaminants that are in the soil. A cap can be a building, or it can be asphalt, concrete, or clean soil with stabilizing vegetation. The materials and specifications for the existing pavement and vegetative caps, and shoreline protection systems are provided in Appendix D of this Operation and Maintenance Plan. The type of cap that should be implemented after excavation is complete should be decided during the planning and design phase and must ensure that the replacement caps are consistent with the Record of Decision (ROD) remedies specified for the various OUs.

Prior to placement of backfill material, an “indicator layer” delineating the start of pre-existing fill material shall be placed in the excavation. This material can be of various materials and will need to be approved by the immediate supervisor, or for contractors, the Contracting Officer.

If there are no directions for capping the site after excavation, please bring it to the attention of the supervisor, or for contractors, the Contracting Officer. In addition, if repairs other than those specified in Appendix D are desired, approval from the NAVFAC NW Environmental Department is required prior to the start of the excavation activities.

Repairs that are conducted as a result of ROD inspections will be documented in reports prepared by NAVFAC NW. The reports will summarize the work activities performed, including the materials used, specifications followed, and any quality control inspections or testing that is conducted.

WASTE DISPOSAL AND MANAGEMENT. All waste, including excavated soil, must be characterized and designated prior to leaving the BNC. Excavated soil must be managed according to BNC procedures. A complete discussion of waste identification, designation, storage and disposal is available in the most recent revision of the PSNS Hazardous Waste Management Plan (HWMP).

APPENDIX D
REMEDY REPAIR MATERIALS AND SPECIFICATIONS
(ELECTRONIC)

APPENDIX D
REMEDY REPAIR MATERIALS AND SPECIFICATIONS

- **Pavement Specifications**
- **Shoreline Specifications**
- **Vegetation Recommendations**

PAVEMENT SPECIFICATIONS

- **Area 1**
- **Area 2**
- **Area 3 – Typical Pavement Specifications**

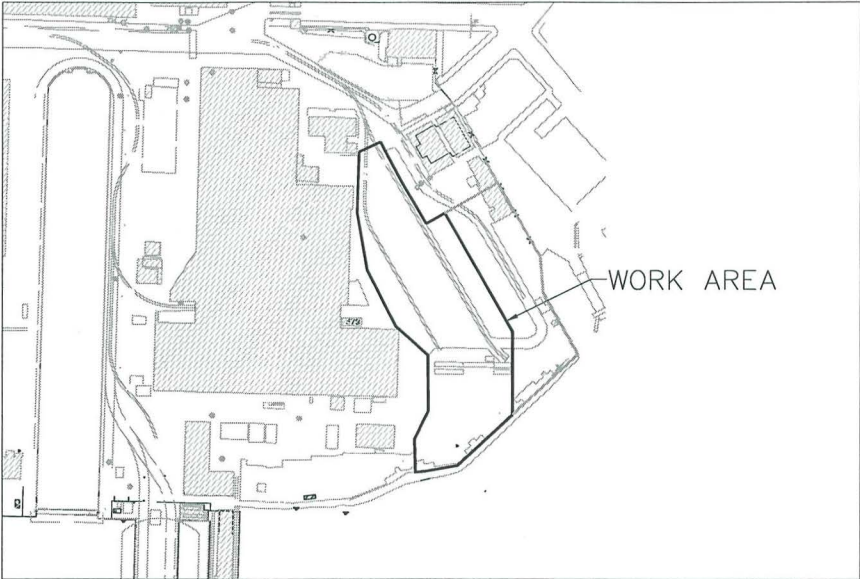
Area 1

Remedial Action Report
East End Capping - Operable Unit D
Bremerton Naval Complex
Bremerton, Washington

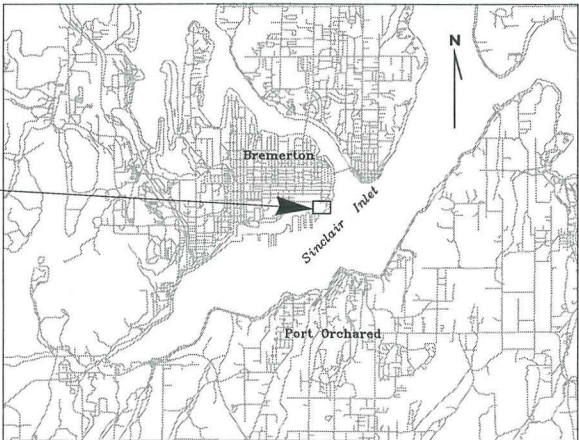
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2597-21-CS01	TITLE SHEET, DRAWING LIST AND SITE LOCATION MAPS	SHEET 1	
2597-21-DP01	DEMOLITION PLAN	SHEET 2	
2597-21-SD01	STORM DRAIN PLAN	SHEET 3	
2597-21-GP01	GRADING PLAN	SHEET 4	
2597-21-DT01	SECTIONS & DETAILS 1 OF 4	SHEET 5	
2597-21-DT02	SECTIONS & DETAILS 2 OF 4	SHEET 6	
2597-21-DT03	SECTIONS & DETAILS 3 OF 4	SHEET 7	
2597DT04	SECTIONS & DETAILS 4 OF 4	SHEET 8	



KEY MAP



SITE LOCATION MAP



VICINITY MAP (NTS)

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POULSBORO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON

TITLE SHEET, DRAWING LIST
AND SITE LOCATION MAPS



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APPROVED
LB

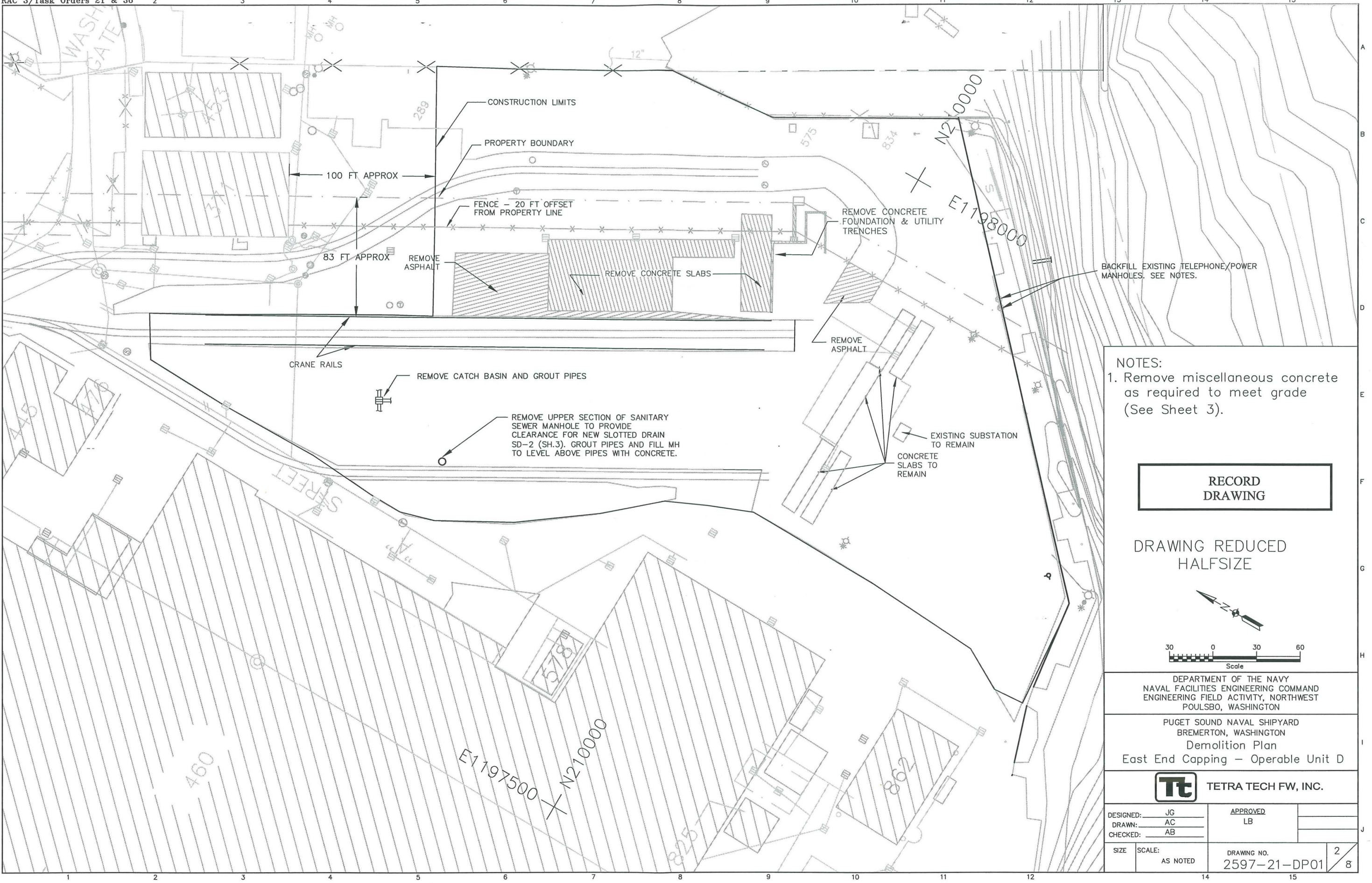
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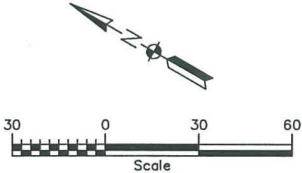
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NOTES:
1. Remove miscellaneous concrete as required to meet grade (See Sheet 3).

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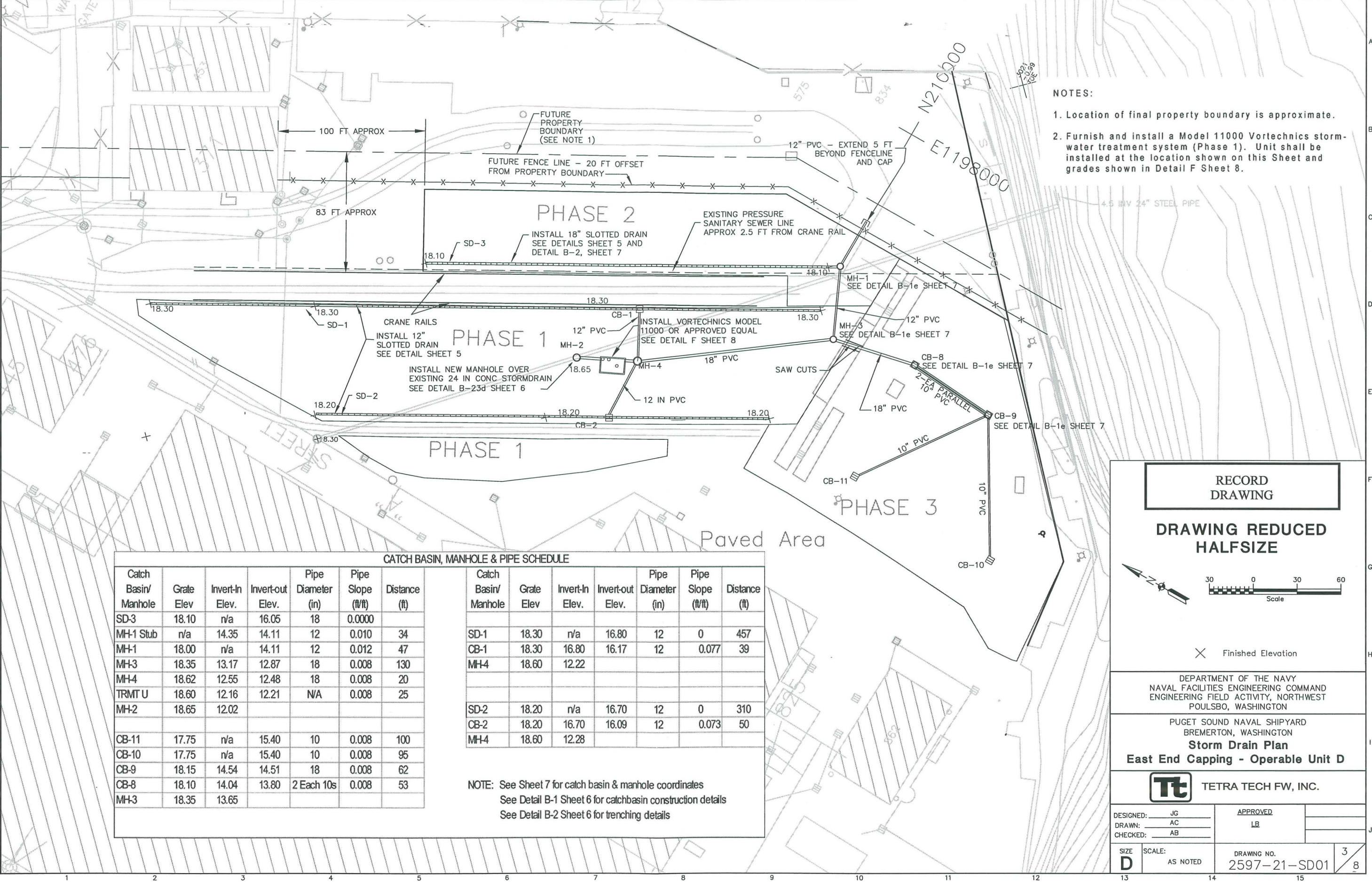


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PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON
Demolition Plan
East End Capping - Operable Unit D

Tt TETRA TECH FW, INC.

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SIZE: AS NOTED	DRAWING NO. 2597-21-DP01	2/8



- NOTES:
- 1. Location of final property boundary is approximate.
 - 2. Furnish and install a Model 11000 Vortech storm-water treatment system (Phase 1). Unit shall be installed at the location shown on this Sheet and grades shown in Detail F Sheet 8.

CATCH BASIN, MANHOLE & PIPE SCHEDULE													
Catch Basin/ Manhole	Grate Elev	Invert-In Elev.	Invert-out Elev.	Pipe Diameter (in)	Pipe Slope (ft/ft)	Distance (ft)	Catch Basin/ Manhole	Grate Elev	Invert-In Elev.	Invert-out Elev.	Pipe Diameter (in)	Pipe Slope (ft/ft)	Distance (ft)
SD-3	18.10	n/a	16.05	18	0.0000		SD-1	18.30	n/a	16.80	12	0	457
MH-1 Stub	n/a	14.35	14.11	12	0.010	34	CB-1	18.30	16.80	16.17	12	0.077	39
MH-1	18.00	n/a	14.11	12	0.012	47	MH-4	18.60	12.22				
MH-3	18.35	13.17	12.87	18	0.008	130							
MH-4	18.62	12.55	12.48	18	0.008	20	SD-2	18.20	n/a	16.70	12	0	310
TRMT U	18.60	12.16	12.21	N/A	0.008	25	CB-2	18.20	16.70	16.09	12	0.073	50
MH-2	18.65	12.02					MH-4	18.60	12.28				
CB-11	17.75	n/a	15.40	10	0.008	100							
CB-10	17.75	n/a	15.40	10	0.008	95							
CB-9	18.15	14.54	14.51	18	0.008	62							
CB-8	18.10	14.04	13.80	2 Each 10s	0.008	53							
MH-3	18.35	13.65											

NOTE: See Sheet 7 for catch basin & manhole coordinates
See Detail B-1 Sheet 6 for catchbasin construction details
See Detail B-2 Sheet 6 for trenching details

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Finished Elevation

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BREMERTON, WASHINGTON

Storm Drain Plan
East End Capping - Operable Unit D

TETRA TECH FW, INC.

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APPROVED
LB

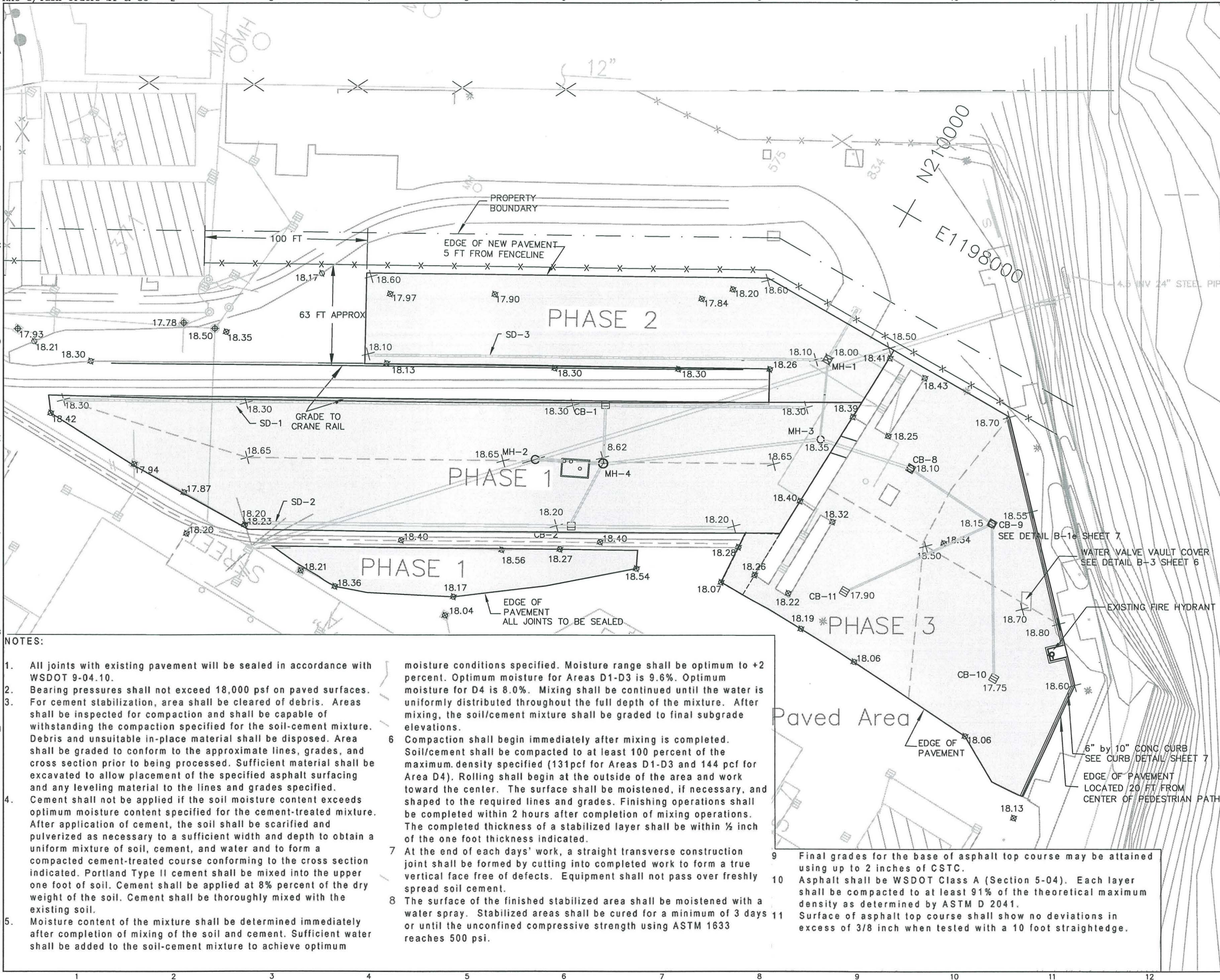
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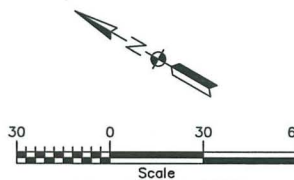
- All joints with existing pavement will be sealed in accordance with WSDOT 9-04.10.
- Bearing pressures shall not exceed 18,000 psf on paved surfaces.
- For cement stabilization, area shall be cleared of debris. Areas shall be inspected for compaction and shall be capable of withstanding the compaction specified for the soil-cement mixture. Debris and unsuitable in-place material shall be disposed. Area shall be graded to conform to the approximate lines, grades, and cross section prior to being processed. Sufficient material shall be excavated to allow placement of the specified asphalt surfacing and any leveling material to the lines and grades specified.
- Cement shall not be applied if the soil moisture content exceeds optimum moisture content specified for the cement-treated mixture. After application of cement, the soil shall be scarified and pulverized as necessary to a sufficient width and depth to obtain a uniform mixture of soil, cement, and water and to form a compacted cement-treated course conforming to the cross section indicated. Portland Type II cement shall be mixed into the upper one foot of soil. Cement shall be applied at 8% percent of the dry weight of the soil. Cement shall be thoroughly mixed with the existing soil.
- Moisture content of the mixture shall be determined immediately after completion of mixing of the soil and cement. Sufficient water shall be added to the soil-cement mixture to achieve optimum moisture conditions specified. Moisture range shall be optimum to +2 percent. Optimum moisture for Areas D1-D3 is 9.6%. Optimum moisture for D4 is 8.0%. Mixing shall be continued until the water is uniformly distributed throughout the full depth of the mixture. After mixing, the soil/cement mixture shall be graded to final subgrade elevations.
- Compaction shall begin immediately after mixing is completed. Soil/cement shall be compacted to at least 100 percent of the maximum density specified (131pcf for Areas D1-D3 and 144 pcf for Area D4). Rolling shall begin at the outside of the area and work toward the center. The surface shall be moistened, if necessary, and shaped to the required lines and grades. Finishing operations shall be completed within 2 hours after completion of mixing operations. The completed thickness of a stabilized layer shall be within 1/2 inch of the one foot thickness indicated.
- At the end of each days' work, a straight transverse construction joint shall be formed by cutting into completed work to form a true vertical face free of defects. Equipment shall not pass over freshly spread soil cement.
- The surface of the finished stabilized area shall be moistened with a water spray. Stabilized areas shall be cured for a minimum of 3 days or until the unconfined compressive strength using ASTM 1633 reaches 500 psi.
- Final grades for the base of asphalt top course may be attained using up to 2 inches of CSTC.
- Asphalt shall be WSDOT Class A (Section 5-04). Each layer shall be compacted to at least 91% of the theoretical maximum density as determined by ASTM D 2041.
- Surface of asphalt top course shall show no deviations in excess of 3/8 inch when tested with a 10 foot straightedge.

RECORD
DRAWING

LEGEND

- Area Paved
- Catch Basin
- Drainage Divide
- Fire Hydrant
- Light Pole
- Final Grade Spot Elevation
- Existing Grade Spot Elevation

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PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON

Grading Plan
East End Capping - Operable Unit D

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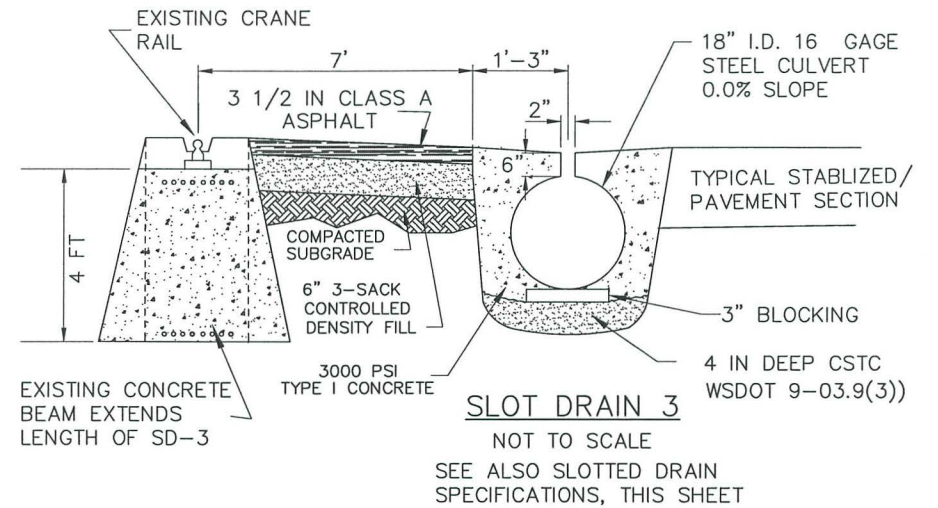
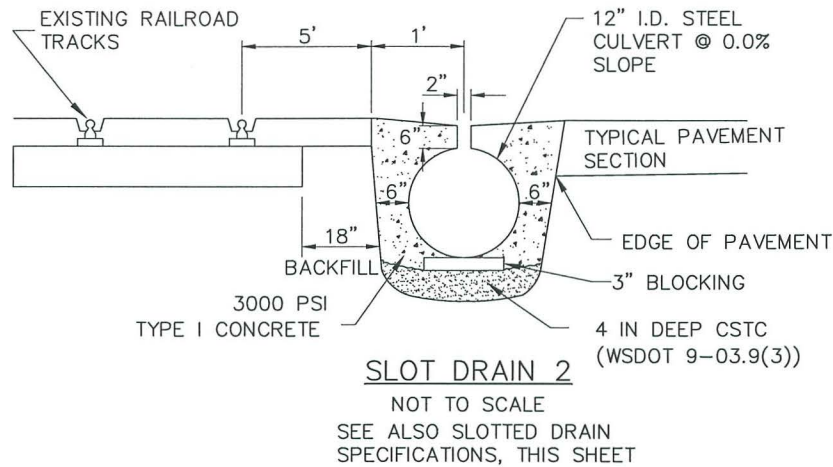
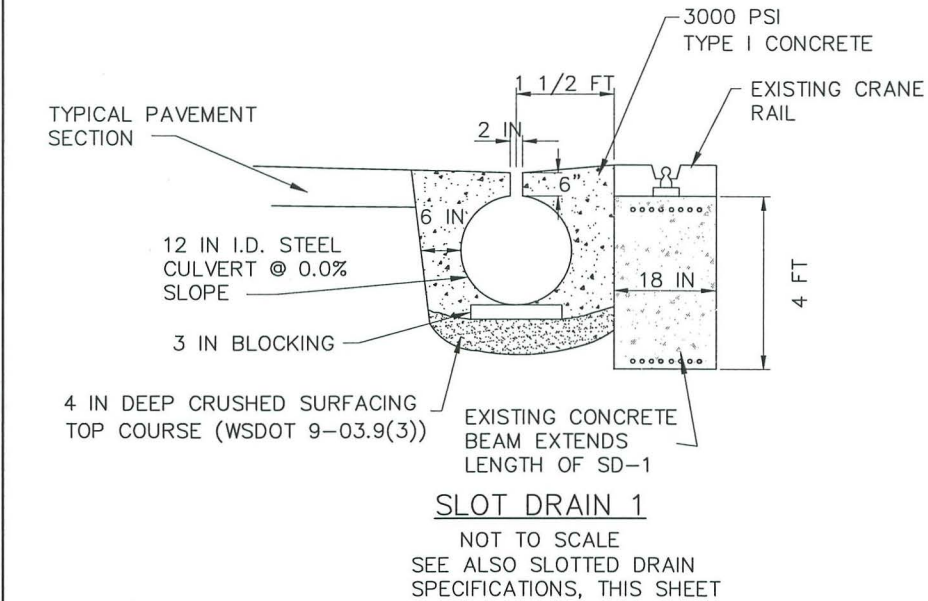
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Slotted Drain Specification
Trapezoidal Slot

1 General

- 1.1 This specification covers Slotted Drain used for the removal of water as shown on the plans.
1.2 The Corrugated Steel Pipe used in the Slotted Drain shall meet the requirements of AASHTO M36/ASTM A760. The CSP shall be Aluminized Steel Type 2 per AASHTO M274. The diameter and gage shall be as shown on the plans.

2 Connections

- 2.1 The Corrugated Steel Pipe (CSP) shall have a minimum of two rerolled annular ends.
2.2 The Slotted drain bands shall be modified HUGGER bands to secure the pipe and prevent infiltration of the backfill.
2.3 When the Slotted Drain is banded together, the adjacent grates shall have a maximum 3" gap for 12" CSP and 9" gap for 18" CSP.
2.4 SD-1 and SD-2 shall have 2 end caps. SD-3 shall have 1 end cap.

3 Grates

- 3.1 The grates shall be manufactured from ASTM A570, Grade 36 steel. The spacers and bearing bars (sides) shall be 3/16" material + 0.008".
3.2 The spacers shall be on 6" centers and welded on both sides to each bearing bar (sides) with four (4) 1-1/4" long x 3/16" fillet welds on each side of the bearing bar.
3.3 The engineer may call for tensile strength tests on the grate if the grate is not in compliance with section 3.2. If tensile strength tests are called for, minimum results for an in-place spacer pulled perpendicular to the bearing bar shall be:
T = 12,000 pounds for 2.5" tall grate
T = 15,000 pounds for 6" tall grate
3.4 The grates shall be trapezoidal with a 1.75" opening in the top and 30 degree slanted spacer unless shown otherwise on the plans. The grate shall be 2.5" or 6" tall as shown on the plans.

4 Galvanizing

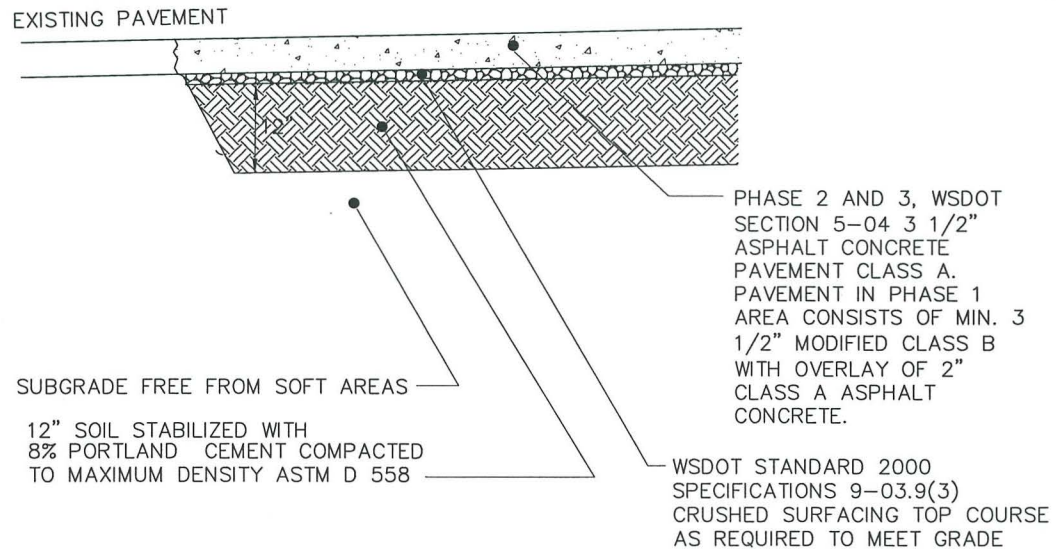
- 4.1 The grate shall be galvanized in accordance with ASTM A 123 except with a 2 ounce galvanized coating.

5 Grate Attached to CSP

- 5.1 The grate shall be fillet welded with a minimum weld of 1" long to the CSP on each side of the grate at every other corrugation.

6 Tolerances

- 6.1 Vertical Bow + 3/8"
6.2 Horizontal Bow + 5/8"
6.3 Twist + 1/2"



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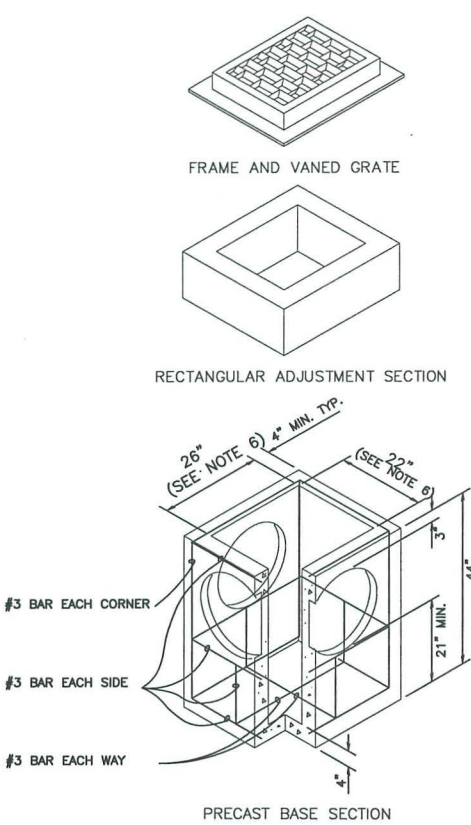
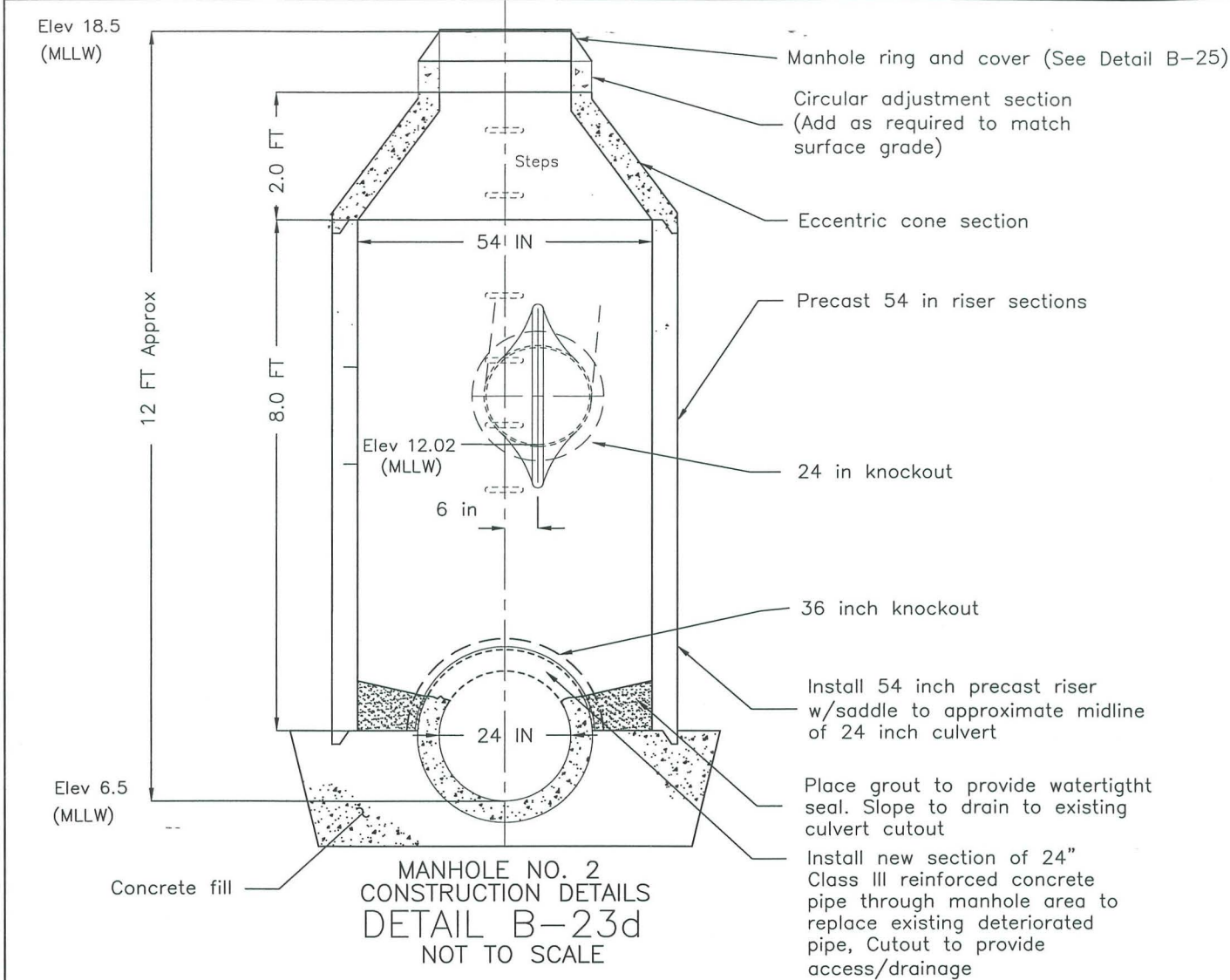
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PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON
SECTIONS & DETAILS
1 OF 4

Tt TETRA TECH FW, INC.

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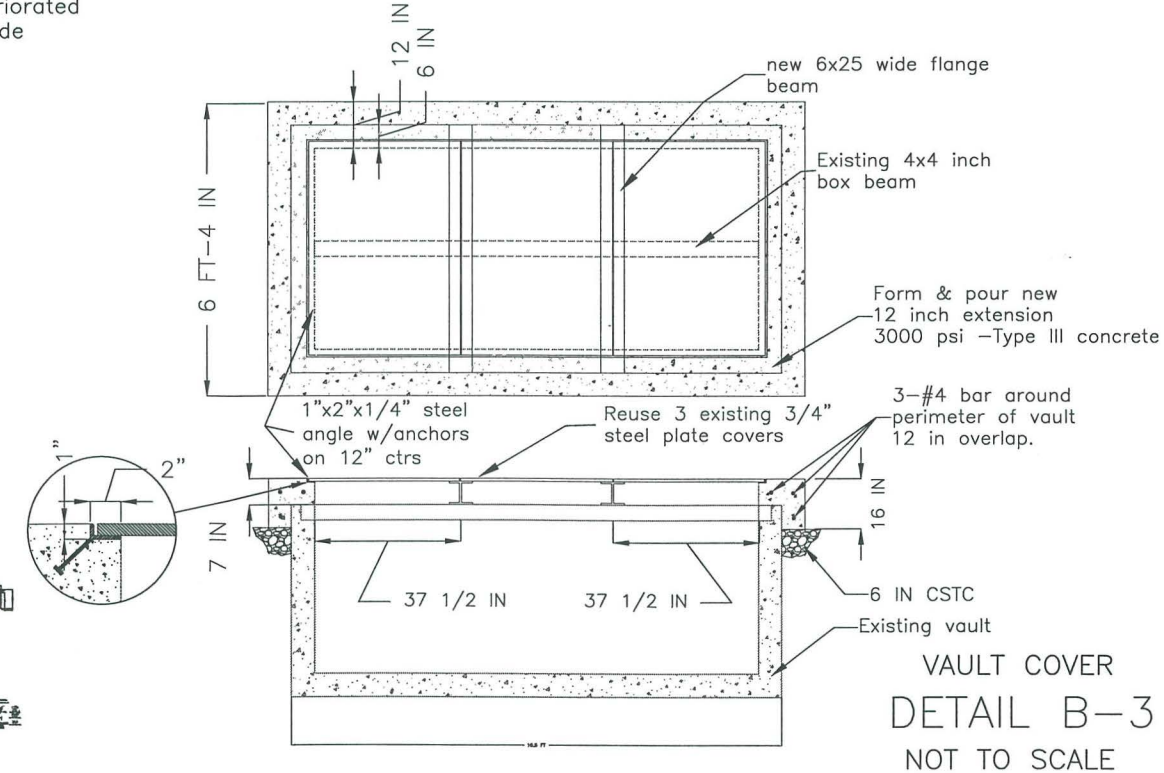
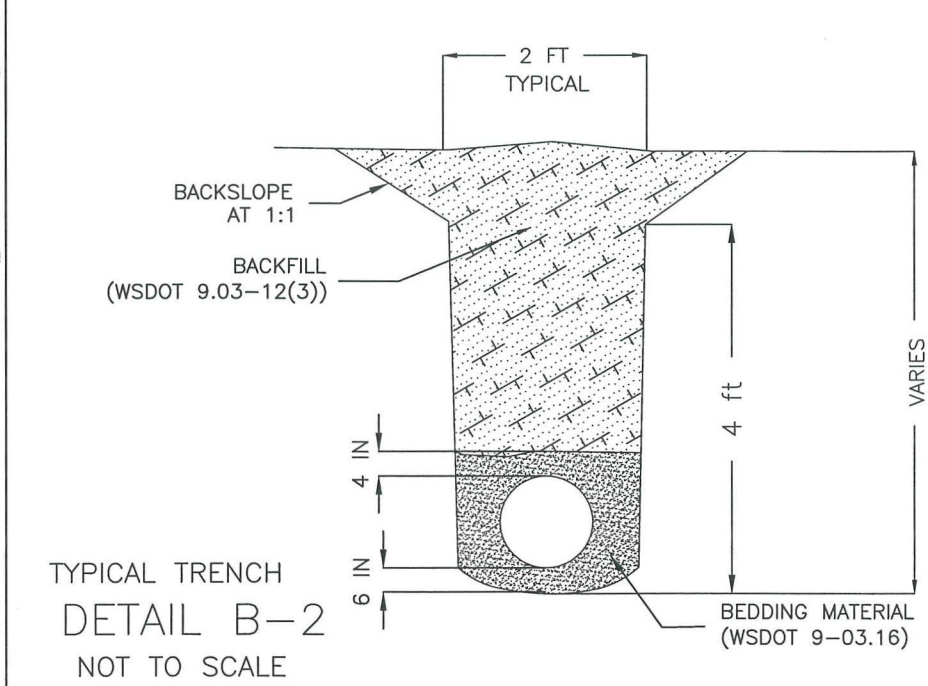


- NOTES
1. As an acceptable alternate to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used. Wire mesh shall not be placed in knockouts.
 2. The knockout diameter shall not be greater than 20". Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum. Provide a 1.5" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with Std. Spec. 9-04.3.
 3. The maximum depth from the finished grade to the pipe invert shall be 5'.
 4. Frame and grate may be installed with flange down or cast into adjustment section.
 5. The precast base section may have a rounded floor and the walls may be sloped at a rate of 1:24 or steeper.
 6. Opening shall be measured at the top of the precast base section.

PIPE ALLOWANCES	
PIPE MATERIAL	MAXIMUM INSIDE DIAMETER
REINFORCED OR PLAIN CONCRETE	12"
ALL METAL PIPE	15"
CPSPSP	12"
SOLID WALL PVC	15"
PROFILE WALL PVC	15"

*CORRUGATED POLYETHYLENE STORM SEWER PIPE

TYPE 1 CATCH BASIN
DETAIL B-1
NOT TO SCALE



RECORD
DRAWING

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NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY, NORTHWEST
POULSBORO, WASHINGTON

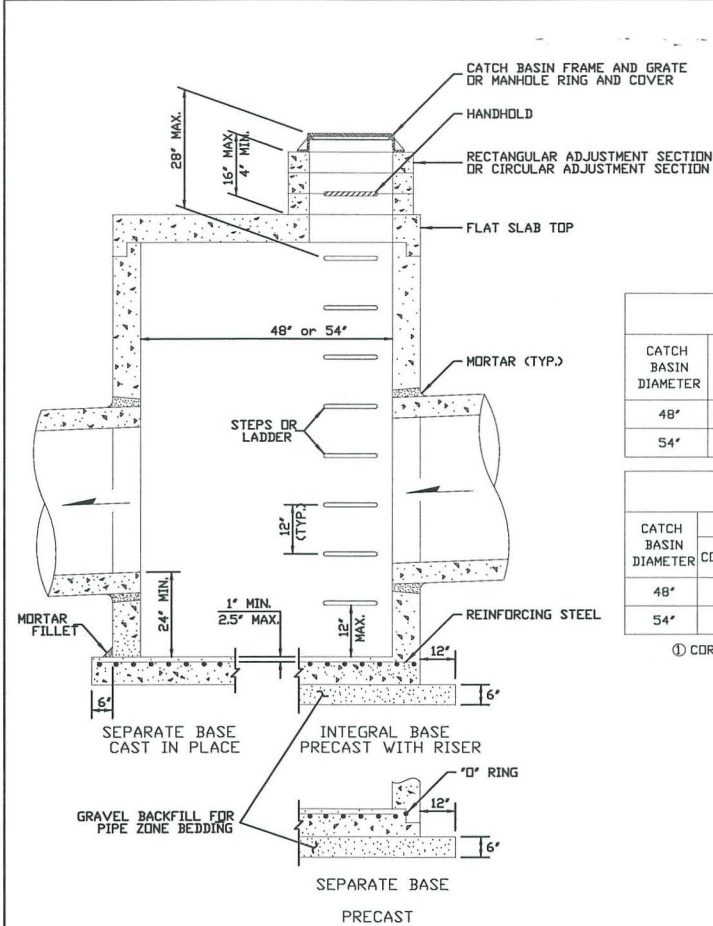
PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON

SECTIONS & DETAILS
SHEET 2 of 4

Tt TETRA TECH FW, INC.

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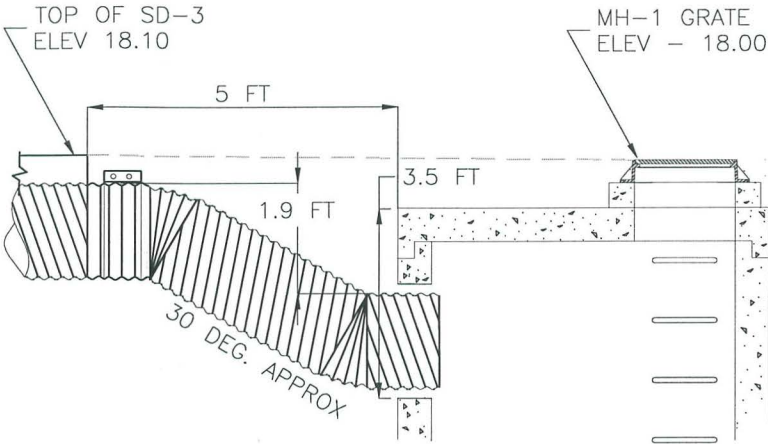
- NOTES
1. No steps are required when height is 4' or less.
 2. The bottom of the precast catch basin may be sloped to facilitate cleaning.
 3. Frame and grate may be installed with flange down or cast into adjustment section.
 4. Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum. Provide a 1.5" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with Std. Spec. 9-04.3.

CATCH BASIN DIMENSIONS						
CATCH BASIN DIAMETER	WALL THICKNESS	BASE THICKNESS	MAXIMUM KNOCKOUT SIZE	MINIMUM DISTANCE BETWEEN KNOCKOUTS	BASE REINFORCING STEEL In 2' IN EACH DIRECTION	
					INTEGRAL	SEPARATE
48"	4"	6"	36"	8"	0.15	0.23
54"	4.5"	8"	42"	8"	0.19	0.19

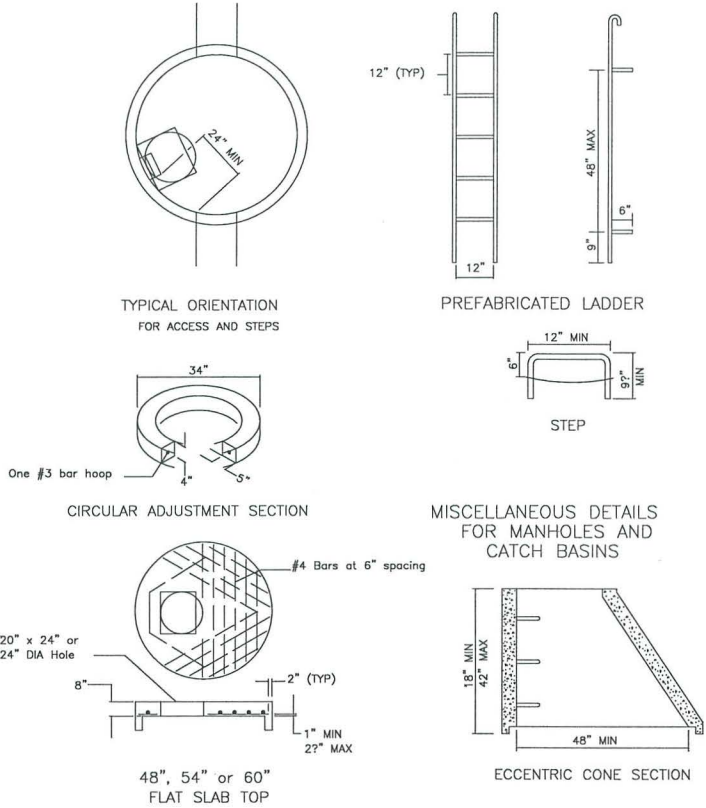
PIPE ALLOWANCES					
CATCH BASIN DIAMETER	PIPE MATERIAL WITH MAXIMUM INSIDE DIAMETER				
	CONCRETE	ALL METAL	CPSSP ①	SOLID WALL PVC	PROFILE WALL PVC
48"	24"	30"	24"	27"	30"
54"	30"	36"	30"	27"	36"

① CORRUGATED POLYETHYLENE STORM SEWER PIPE

TYPE 2 CATCH BASIN
NOT TO SCALE
DETAIL B-1e



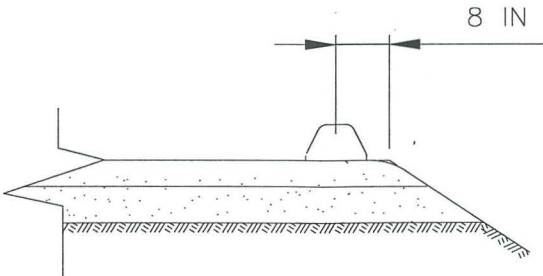
SD-3 TO MH-1
CONNECTION
DETAIL B-2
NOT TO SCALE



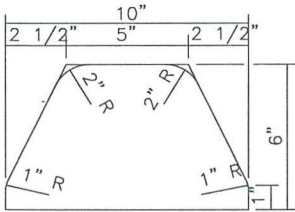
TYPE 2 CATCH BASIN
APPURTENANCES
DETAIL B-1z
NOT TO SCALE

CATCH BASIN & MANHOLE LOCATIONS

Structure	Northing	Easting	Grate Elev (ft-MLLW)
CB-1	210,100.6	1,197,804.1	18.30
CB-2	210,081.9	1,197,729.3	18.20
CB-8	209,918.9	1,197,864.1	18.10
CB-9	209,858.4	1,197,859.6	18.15
CB-10	209,808.6	1,197,774.1	17.75
CB-11	209,916.0	1,197,777.9	17.75
MH-1	209,996.7	1,197,897.0	18.00
MH-2	210,121.3	1,197,753.5	18.65
MH-3	209,975.7	1,197,851.9	18.35
MH-4	210,083.9	1,197,772.4	18.60
SD-1No	210,391.0	1,197,640.6	18.30
SD-1So	209,992.8	1,197,864.7	18.30
SD-2No	210,255.3	1,197,631.4	18.20
SD-2So	209,986.5	1,197,782.8	18.20
SD-3N	210,242.8	1,197,758.5	18.10
SD-3S	209,998.2	1,197,896.3	18.10



SECTION



- NOTES:
1. provide control jts. at 10' o.c.
 2. secure to existing pavement with 2-part epoxy adhesive.

CONCRETE CURB

EXTRUDED CURB
DETAIL G-4b
NOT TO SCALE

RECORD
DRAWING

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY, NORTHWEST
POULSBO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON

SECTIONS & DETAILS
SHEET 3 of 4



TETRA TECH FW, INC.

DESIGNED: JG
DRAWN: AC
CHECKED: JG

APPROVED
LB

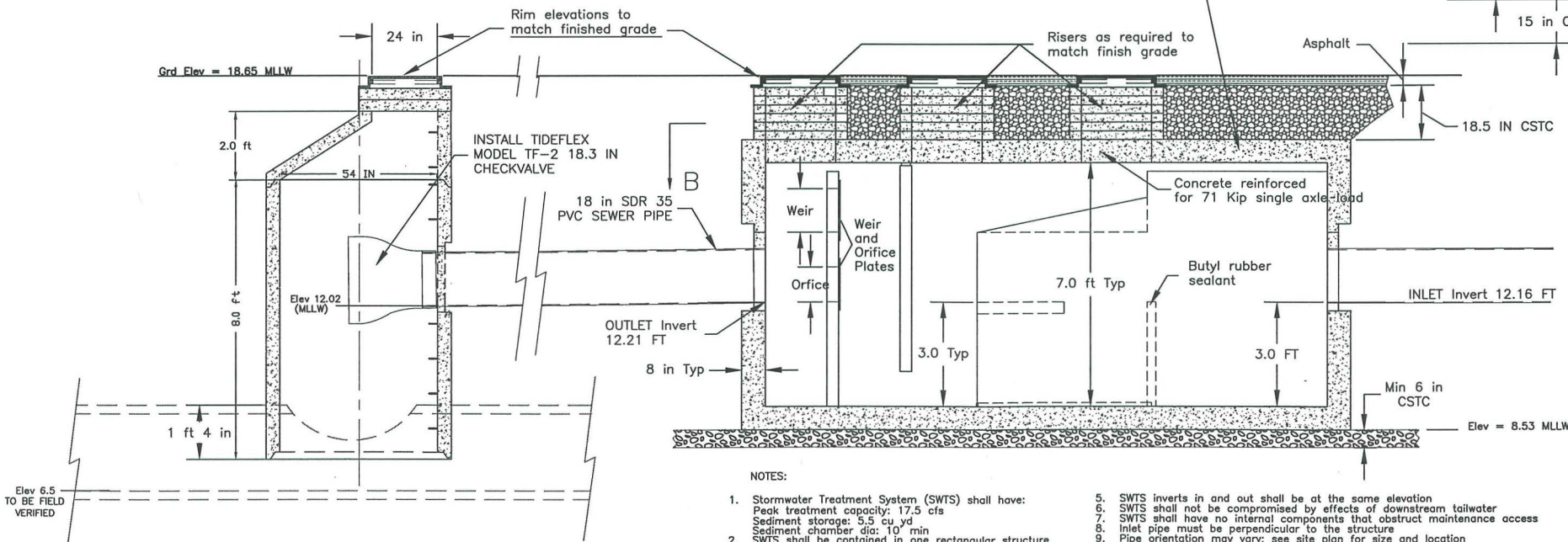
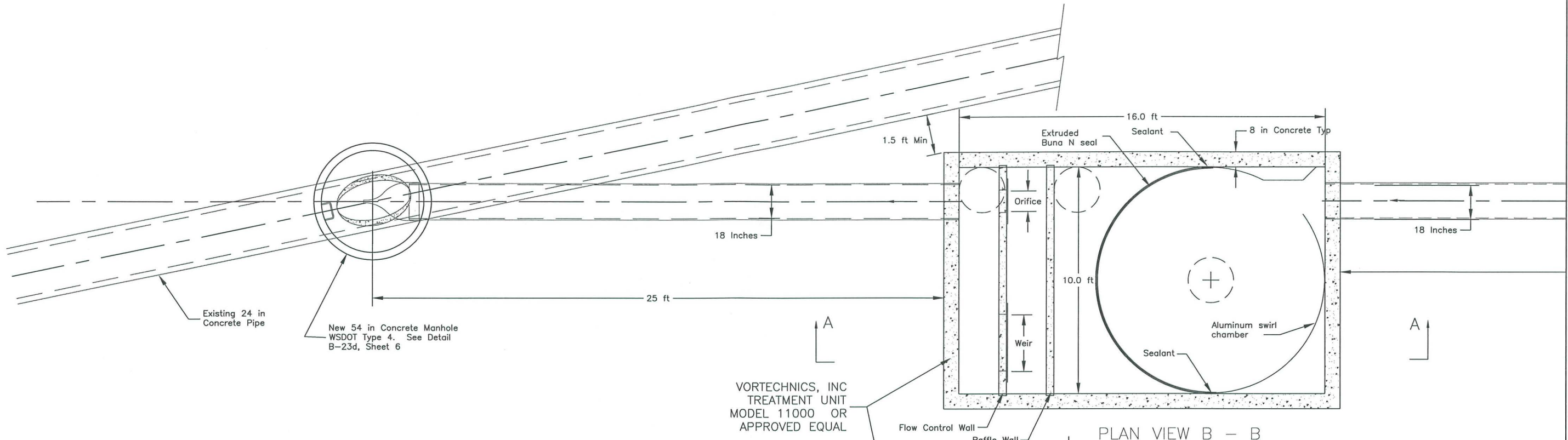
SIZE
D

SCALE:
AS NOTED

DRAWING NO.
2597-21-DT03

7
8

P:\TO 21\Engineering\TO 21 Drawings\dwg\2597dt04.dwg 10/27/03



- NOTES:
- Stormwater Treatment System (SWTS) shall have:
Peak treatment capacity: 17.5 cfs
Sediment storage: 5.5 cu yd
Sediment chamber dia: 10' min
 - SWTS shall be contained in one rectangular structure
 - SWTS shall remove 80% of the net annual TSS loading based on a 50 micron size particle
 - SWTS shall retain floatables and trapped sediment up to and including peak treatment capacity
 - SWTS inverts in and out shall be at the same elevation
 - SWTS shall not be compromised by effects of downstream tailwater
 - SWTS shall have no internal components that obstruct maintenance access
 - Inlet pipe must be perpendicular to the structure
 - Pipe orientation may vary; see site plan for size and location
 - Contractor shall not be responsible for assembly of unit
 - Manhole frames and perforated covers supplied with system, not installed
 - Contractor to prepare excavation and provide crane for off-loading & setting at time of delivery
 - Contact Vortechonics © (207) 885-9830 for information

DETAIL F

RECORD
DRAWING

DRAWING REDUCED
HALFSIZE
NOT TO SCALE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY, NORTHWEST
POULSBORO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON

SECTIONS & DETAILS
SHEET 4 OF 4

Tt TETRA TECH FW, INC.

DESIGNED: PRG	APPROVED: LB	REV 0
DRAWN: AC		
CHECKED: JG		
SIZE: D	SCALE: AS NOTED	DRAWING NO. 2597DT04
		8/8

Area 2

GENERAL NOTES AND DESIGN CRITERIA

- THE PROJECT CONSISTED OF PAVING THE EXISTING GRAVEL AREA IN SITE 1 WITH CEMENT CONCRETE PAVEMENT AND ASPHALT CONCRETE PAVEMENT TO SUPPORT THE RELOCATED DRMO AREA. THE SITE WILL BE PAVED IN 2 PHASES, SITE 1A AND 1B AS SHOWN ON DRAWING BE 237-4. THE EXISTING DRMO OPERATION RELOCATED TO SITE 1 CONSISTS OF USING:
 - TRACKED EQUIPMENT SUCH AS A CATERPILLAR 235C GRAPPLE
 - A VARIETY OF FORK LIFTS RANGING IN LIFTING CAPACITY FROM 3 TON TO 15 TONS
 - 40 CUBIC YARD ROLLOFF BOXES WHICH ARE FILLED AND REMOVED WITH A FLATBED TRAILER
 - 5 CY BOXES WHICH ARE FILLED WITH SCRAP MATERIAL AND LIFTED WITH A CRANE TO FILL THE 40 CUBIC YARD BOXES.PAVEMENT THICKNESS WAS DESIGNED TO HANDLE THESE ANTICIPATED LOADS.
- THE DESIGN OBJECTIVE WAS TO REDUCE POTENTIAL FOR HUMAN CONTACT WITH THE SOIL AND TO REDUCE POTENTIAL FOR CONTAMINANT MIGRATION. THE PAVED SURFACE PROVIDES A MINIMUM 40-FOOT WIDE CONCRETE SURFACE TO SUPPORT THE TRACKED EQUIPMENT, FORKLIFTS, AND ASPHALT CONCRETE PAVEMENT TO SUPPORT ROLLOFF BOXES AND MISCELLANEOUS VEHICLES SUCH AS PICK UP TRUCKS AND CARS.
- CONCRETE PAVING WAS DESIGNED TO MEET THE FOLLOWING CRITERIA:
 - MAXIMUM WHEEL LOAD OF 27 KIPS FROM A FORKLIFT HAVING DUAL WHEEL PNEUMATIC TIRES
 - MAXIMUM WHEEL LOAD OF 25 KIPS FROM A FORKLIFT HAVING SINGLE WHEEL PNEUMATIC TIRES
 - MAXIMUM WHEEL LOAD FROM AASHTO, HS-20 TRUCK AND TRAILER
 - WHEEL LOAD FROM THE 40 CUBIC YARD ROLLOFF BOXES WEIGHING 40 KIPS MAXIMUM. BOXES ARE LOADED ONE AT A TIME AND EQUIPMENT WILL BE OPERATED ON THE CONCRETE PAVEMENT AREA ONLY. IT WILL HAVE PROTECTIVE SHOES DURING OPERATION TO PROTECT CONCRETE SURFACE AGAINST ABRASION.
- ASPHALT CONCRETE PAVEMENT ON EAST AND WEST SIDES OF THE CONCRETE PAVING WAS DESIGNED TO MEET THE FOLLOWING CRITERIA:
 - MAXIMUM WHEEL LOAD FROM AASHTO HS-20 TRUCK AND TRAILER
 - STORAGE OF ROLLOFF BOXES AND METAL PILES. THE ASPHALT SURFACE SHALL BE PROTECTED BY PLACING STEEL PLATES UNDER THE ROLLOFF BOXES AND THE METAL PILES.ASPHALT PAVING NORTH OF THE CONCRETE PAVING WAS DESIGNED AS A PARKING LOT SUPPORTING PICK UP TRUCKS AND CARS.
- THE ENTIRE SITE SLOPES AWAY FROM THE SINCLAIR INLET SIDE AND DRAINS TO EXISTING OR NEW CATCH BASINS ADJACENT TO THE EXISTING CRANE RAILS.
- AN ASPHALT CURB AND CONCRETE BARRIERS ARE PLACED ALL ALONG THE SINCLAIR INLET SIDE AS SHOWN. AN ASPHALT CURB IS PLACED ALONG THE WEST SIDE TO DIRECT DRAINAGE. AN ACCESS RAMP IS PROVIDED TO ACCESS SITE 1B AS SHOWN.
- THE PACKAGE OF DRAWINGS BE 237-1 THRU BE 237-16, REVISION 1, SHOWS THE AS CONSTRUCTED PROJECT WHICH MEETS THE DESIGN OBJECTIVE AND CRITERIA GIVEN IN NOTES 2, 3, 4, AND 5. THE DESIGN IS SHOWN ON A BASE MAP, WHICH WAS PREPARED BY COLLECTING INFORMATION ABOUT EXISTING CONDITIONS BY VISUAL OBSERVATION ON JANUARY 22, 1998, AND A FIELD SURVEY PERFORMED BY INCA ENGINEER ON MARCH 18, 1998. THE TOPOGRAPHIC SURVEY IS SHOWN ON DRAWINGS BE 237-11 AND BE 237-12.
- THE DIRECT CONTACT BETWEEN THE SHOES, RAILS, FEET AND ROLLERS OF THE ROLLOFF BOXES, AS WELL AS THE TRACKS OF THE CATERPILLAR 235C GRAPPLE AND THE SURFACE OF THE PAVEMENT WILL RESULT IN ABRASION AND DAMAGE OF THE PAVEMENT SURFACE. THE CEMENT CONCRETE PAVEMENT MAY REQUIRE MAINTENANCE SUCH AS APPLICATION OF METALLIC AGGREGATE TOPPING IN HIGH ABRASIVE AREA AND FILLING OF CRACKS AND LOW SPOTS WITH EPOXY GROUT IN CRACKED AREAS. FUTURE MAINTENANCE OF ASPHALT CONCRETE PAVEMENT MAY REQUIRE RESURFACING OF THE ASPHALT CONCRETE PAVEMENT. ABRASION RESISTANCE OF THE CONCRETE SURFACE CAN BE INCREASED BY THE APPLICATION OF A METALLIC SURFACE HARDENER.
- NUMEROUS UNDERGROUND UTILITIES EXIST ON THE SITE. THE UTILITIES INCLUDE DIRECT BURIAL ELECTRICAL, ELECTRICAL IN DUCTS, TELEPHONE IN CONCRETE ENCASED DUCTS, ELECTRICAL IN CONCRETE ENCASED DUCTS, STEAM DUCTS, STORM DRAINAGE PIPES, POTABLE WATER LINES, SALTWATER FIRE LINES, AND SANITARY SEWER LINES. VARIOUS BURIED UTILITIES ENCROACH INTO THE PAVEMENT SECTION. INTERFERENCES BETWEEN THE EXISTING BURIED UTILITIES AND THE PAVEMENT SECTION WERE BROUGHT TO THE ATTENTION OF THE SENIOR PROJECT ENGINEER FOR DESIGN DEVELOPMENT OF THE SITE SPECIFIC SITUATION.
- ALL WORK CONFORMS, AS A MINIMUM, TO THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION PUBLISHED BY THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION AND THE WASHINGTON STATE CHAPTER OF THE AMERICAN PUBLIC WORKS ASSOCIATION, AND OTHER REGULATORY AGENCIES EXERCISING AUTHORITY OVER ANY PORTION OF THE WORK AS APPLICABLE OR AS NOTED IN THE SPECIFICATIONS.
- SPECIFIC NOTES AND DETAILS TOOK PRECEDENCE OVER GENERAL NOTES AND TYPICAL DETAILS.
- THE SITE SUPERINTENDENT REFERRED TO THE SPECIFICATIONS, ENVIRONMENTAL PROTECTION PLAN, SAMPLING AND ANALYSIS PLAN, SITE WORK PLAN, ADDENDUM TO THE CONTRACTORS QUALITY CONTROL PLAN AND SITE HEALTH AND SAFETY PLAN FOR INFORMATION NOT COVERED BY THESE GENERAL NOTES ON THE DRAWINGS.
- CONCRETE PAVEMENT IS FIBER REINFORCED CONCRETE. FIBERS ARE 100 PERCENT VIRGIN POLYPROPYLENE. A MINIMUM OF 1.5 POUNDS OF FIBERS PER CUBIC YARD OF CONCRETE WAS USED.

LEGEND

X 131.8	SPOT ELEVATION
⊗ 211.2	GRADING PLAN SPOT ELEVATION
-150-	EXISTING INDEX CONTOUR
-150-	EXISTING INTERMEDIATE CONTOUR
-150-	NEW INDEX CONTOUR
-150-	NEW INTERMEDIATE CONTOUR
-150-	FENCE
-150-	CHECK DAM
-150-	SILT FENCE
-150-	FILL EMBANKMENT
-150-	CUT EMBANKMENT
-150-	ORIGINAL INFILTRATION BARRIER
-150-	STORM DRAIN
-150-	TELEPHONE AND ELECTRIC LINE
-150-	WATER
-150-	SWALE, DITCH
2 2:1	SLOPE (HORIZ TO VERT)
-150-	DIRECTION OF FLOW
⊙	EXISTING UTILITY POLE
⊙	MONITORING WELL
⊙	SEALED WELL
⊙	EXISTING MANHOLE
⊙	PROPOSED MANHOLE
ASPHALT PAVING	ASPHALT PAVING
CONCRETE	CONCRETE
EXISTING PREPARED GRADED SUBBASE	EXISTING PREPARED GRADED SUBBASE
COMPACTED TOP COURSE	COMPACTED TOP COURSE
SMALL RIP RAP	SMALL RIP RAP

SYMBOLS

SECTION CUT ON SHEET 18 AND SHOWN ON SHEET 18	SECTION LETTER
SECTION CUT ON SHEET 18 AND SHOWN ON SHEET 22	SECTION LETTER
ON SHEET 22, THIS SECTION IS IDENTIFIED AS:	SECTION LETTER
CATCH BASIN	SECTION LETTER
SECTION CUT ON MORE THAN ONE SHEET	SECTION LETTER
DETAILS ARE REFERENCED IN A SIMILAR MANNER EXCEPT NUMBERS ARE USED INSTEAD OF LETTERS	SECTION LETTER

REVISION IDENTIFICATION

BUILDING
UNDISTURBED NATIVE SOIL
SOIL COVER, TOP SOIL
GRAVEL
LARGE RIP RAP
MEDIUM RIP RAP
CONCRETE DEBRIS

NO	DATE	REVISION	BY	CH	APPROVED
0	4/8/98	ISSUED FOR CONSTRUCTION	KK	TDG	SPJ/SM
1	10/2/98	RECORD SET			

ABBREVIATIONS

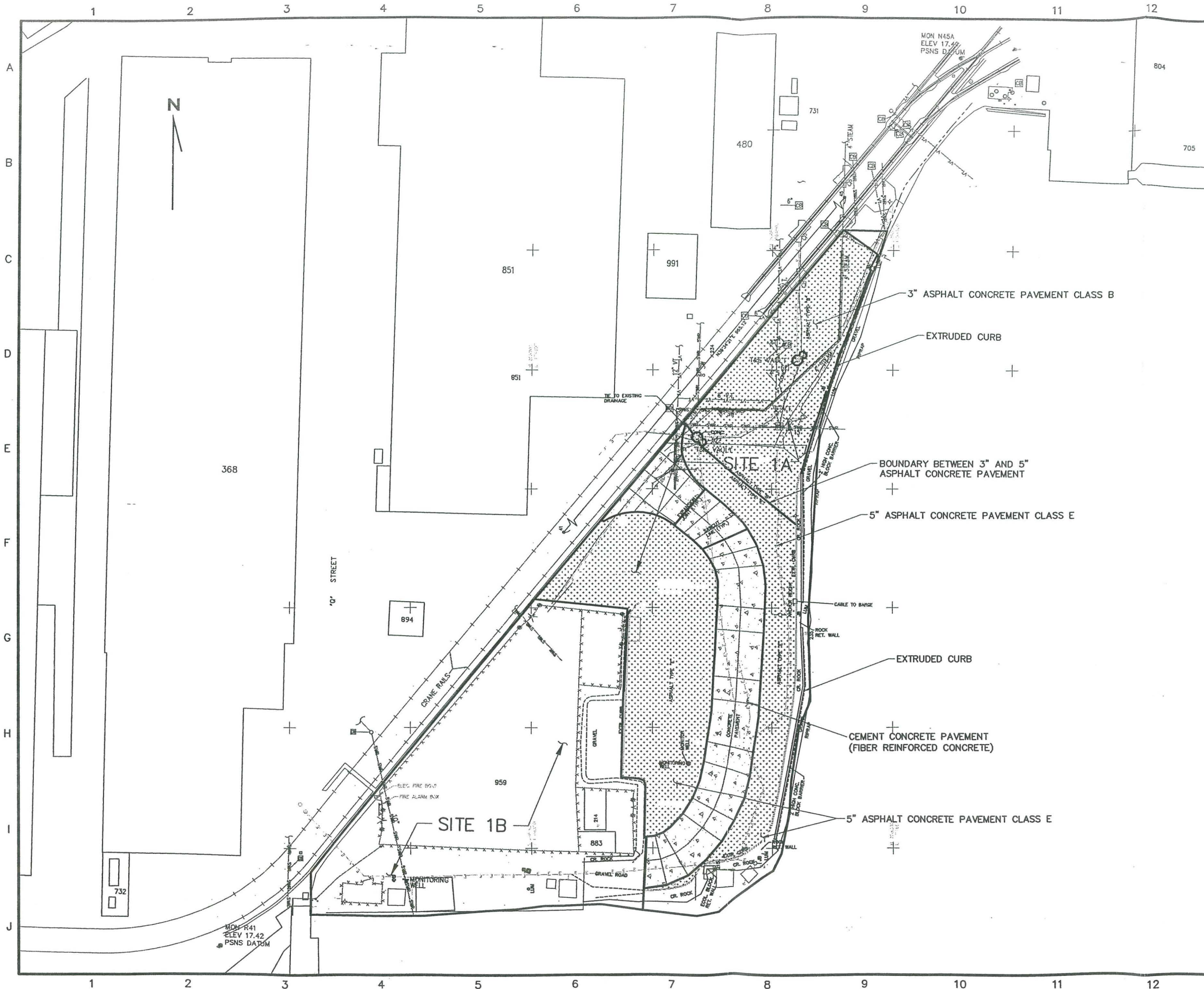
CONC	CONCRETE
DIA	DIAMETER
E	EAST
EL, ELEV	ELEVATION
FT	FOOT, FEET
HOR, HORIZ	HORIZONTAL
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
INV	INVERT
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MW	MONITORING WELL
N	NORTH
OD	OUTSIDE DIAMETER, OUTSIDE DIMENSION
PC	POINT OF CURVATURE-HORIZ
PT	POINT OF TANGENCY-HORIZ
PWR	POWER
R	RADIUS
RCP	REINFORCED CONCRETE PIPE
SCH	SCHEDULE
SD	STORM DRAIN
T	TANGENT LENGTH
TELE	TELEPHONE
TYP	TYPICAL
UTIL	UTILITY, UTILITIES
VERT	VERTICAL
WSDOT	WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY, NORTHWEST
POULSBORO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON
PROPOSED OU B PAVING SITE 1
**GENERAL NOTES, ABBREVIATIONS,
LEGEND AND SYMBOLS**

FOSTER WHEELER ENVIRONMENTAL CORPORATION	
DIVISION: BE GACES	APPROVED: S MONTGOMERY
DRAWN: KSK	SP JAN
CHECKED: TDG	NAVAC. DRAWING NO.
SIZE D	SCALE: NONE
BE 237-2 1	

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PLOT/UPDATE: 08/15/11:19

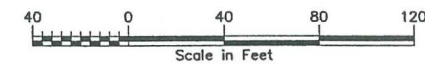


NO	DATE	REVISION	BY	CH	APPROVED
0	4/8/98	ISSUED FOR CONSTRUCTION	KK	TDG	SPJ/SM
1	10/2/98	RECORD SET			

NOTES:

- SEE DRAWING BE 237-2 FOR GENERAL NOTES
- GRADING OF THE SITE WAS ACCOMPLISHED IN THREE STAGES. FIRST THE EXCAVATION OF THE PORTIONS OF THE SITE THAT WERE HIGHER THAN THE BOTTOM OF THE BASE COURSE LAYER TO THE ELEVATION OF THE BOTTOM OF THE BASE COURSE LAYER. SECOND THE FILLING OF THE PORTIONS OF THE SITE THAT WERE LOWER THAN THE BOTTOM OF THE BASE COURSE LAYER TO THE ELEVATION OF THE BOTTOM OF THE BASE COURSE LAYER WITH EXCAVATED MATERIAL. THIRD FILLING THE SITE WITH GRADING FILL AS REQUIRED. SEE DRAWINGS BE237-13, 14, & 15 FOR INITIAL GRADING PLAN AND SECTIONS.
- THE EXISTING MONITORING WELL WAS ADJUSTED TO GRADE.
- SITE 1 IS BOUNDED ON THE WEST BY THE EAST EDGE OF THE SOUTH CRANE RAIL BEAM, ON THE NORTH BY A LINE THAT IS THE EXTENSION OF THE SOUTH END OF BUILDING 480 AND ON THE EAST AND ON THE SOUTH BY THE TOP OF THE RIPRAP ALONG SINCLAIR INLET.
- DRAINAGE STRUCTURES AND LIGHTING FEATURES NOT SHOWN ON THIS DRAWING FOR CLARITY. SEE DRAWINGS BE237-5, 6, & 7 FOR DRAINAGE FEATURES AND DRAWINGS BE237-8, 9, & 10 FOR ELECTRICAL FEATURES.

- CEMENT CONCRETE PAVEMENT
- ASPHALT CONCRETE PAVEMENT



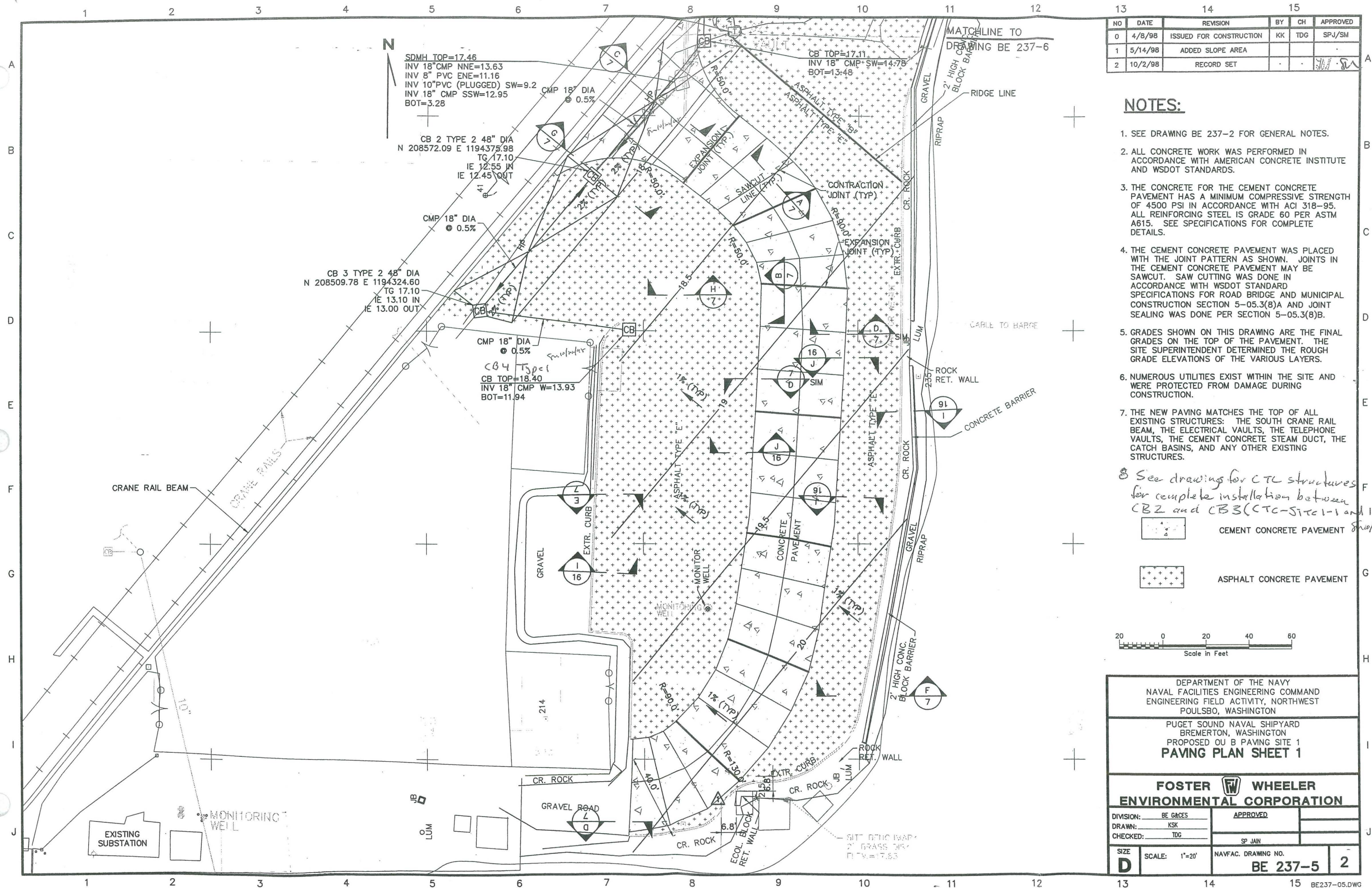
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NAVAL FACILITIES ENGINEERING COMMAND
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POULSBORO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON
PROPOSED QU B PAVING SITE 1

PLOT PLAN

DIVISION: BE GACES		APPROVED	
DRAWN: KSK		S MONTGOMERY	
CHECKED: TDG		SP JAIN	
SIZE: D	SCALE: 1"=40'	NAVJAC. DRAWING NO.	
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		-1	

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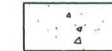


NO	DATE	REVISION	BY	CH	APPROVED
0	4/8/98	ISSUED FOR CONSTRUCTION	KK	TDG	SPJ/SM
1	5/14/98	ADDED SLOPE AREA			
2	10/2/98	RECORD SET			

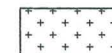
NOTES:

- SEE DRAWING BE 237-2 FOR GENERAL NOTES.
- ALL CONCRETE WORK WAS PERFORMED IN ACCORDANCE WITH AMERICAN CONCRETE INSTITUTE AND WSDOT STANDARDS.
- THE CONCRETE FOR THE CEMENT CONCRETE PAVEMENT HAS A MINIMUM COMPRESSIVE STRENGTH OF 4500 PSI IN ACCORDANCE WITH ACI 318-95. ALL REINFORCING STEEL IS GRADE 60 PER ASTM A615. SEE SPECIFICATIONS FOR COMPLETE DETAILS.
- THE CEMENT CONCRETE PAVEMENT WAS PLACED WITH THE JOINT PATTERN AS SHOWN. JOINTS IN THE CEMENT CONCRETE PAVEMENT MAY BE SAWCUT. SAW CUTTING WAS DONE IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATIONS FOR ROAD BRIDGE AND MUNICIPAL CONSTRUCTION SECTION 5-05.3(8)A AND JOINT SEALING WAS DONE PER SECTION 5-05.3(8)B.
- GRADES SHOWN ON THIS DRAWING ARE THE FINAL GRADES ON THE TOP OF THE PAVEMENT. THE SITE SUPERINTENDENT DETERMINED THE ROUGH GRADE ELEVATIONS OF THE VARIOUS LAYERS.
- NUMEROUS UTILITIES EXIST WITHIN THE SITE AND WERE PROTECTED FROM DAMAGE DURING CONSTRUCTION.
- THE NEW PAVING MATCHES THE TOP OF ALL EXISTING STRUCTURES: THE SOUTH CRANE RAIL BEAM, THE ELECTRICAL VAULTS, THE TELEPHONE VAULTS, THE CEMENT CONCRETE STEAM DUCT, THE CATCH BASINS, AND ANY OTHER EXISTING STRUCTURES.

See drawings for CTC structures for complete installation between CB2 and CB3 (CTC-Site 1-1 and 1-2)



CEMENT CONCRETE PAVEMENT

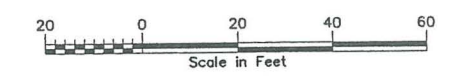
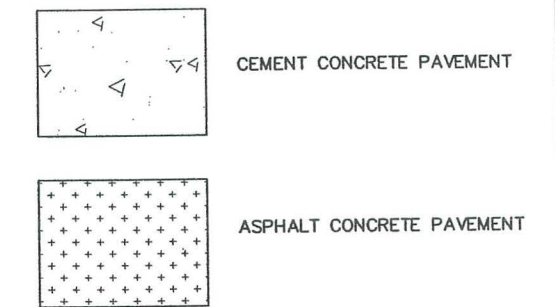


ASPHALT CONCRETE PAVEMENT

NO	DATE	REVISION	BY	CH	APPROVED
0	4/8/98	ISSUED FOR CONSTRUCTION	KK	TDG	SPJ/SM
1	10/2/98	RECORD SET			

NOTES:

- SEE DRAWING BE 237-2 FOR GENERAL NOTES
- ALL ASPHALT WORK WAS PERFORMED IN ACCORDANCE WITH WSDOT STANDARDS
- THE ASPHALT CONCRETE PAVEMENT WAS PLACED TO DRAIN TO THE EXISTING CATCH BASINS. ADEQUACY OF EXISTING CATCH BASIN TO HANDLE ADDITIONAL RUN OFF FROM PAVED SURFACE WAS NOT VERIFIED.
- FINAL GRADES FOR TOP OF THE ASPHALT AND CONCRETE PAVEMENT ARE SHOWN, MATCHES THE CEMENT CONCRETE PAVEMENT, SOUTH CRANE RAIL BEAM, AND SLOPE TO DRAIN TO THE CATCH BASINS.
- GRADES SHOWN ON THIS DRAWING ARE THE FINAL GRADES ON THE TOP OF THE PAVEMENT. THE SITE SUPERINTENDENT DETERMINED THE ROUGH GRADE ELEVATIONS OF THE VARIOUS LAYERS.
- EXISTING PIPE TO BE ABLE TO HANDLE AN ADDITIONAL 3.59 CFS. (PIPE CAPACITY WAS NOT VERIFIED)
- THE SITE SUPERINTENDENT LOCATED THE EXISTING OUTFALL AND DETERMINED THE SIZE AND INVERT OF THE TIE-IN POINT AND COORDINATED WITH PROJECT ENGINEER FOR FINAL DRAINAGE DESIGN.
- NUMEROUS UTILITIES EXIST WITHIN THE SITE AND WERE PROTECTED FROM DAMAGE DURING CONSTRUCTION.
- THE NEW PAVING MATCHES THE TOP OF ALL EXISTING STRUCTURES: THE SOUTH CRANE RAIL BEAM, THE ELECTRICAL VAULTS, THE TELEPHONE VAULTS, THE CEMENT CONCRETE STEAM DUCT, THE CATCH BASINS, AND ANY OTHER EXISTING STRUCTURES.



LEGEND

- BOL MOORING BOLLARD
- CB CATCH BASIN
- MW MONITOR WELL
- VLT VAULT
- UTR UNDERGROUND TELEPHONE RISER
- CP CONCRETE PAD
- GTP GATE POST
- CLO RAILROAD SWITCH
- VLV CLEANOUT
- AV VALVE
- AV AIR VENT
- YL GUARD POST
- LT# YARD LIGHT
- GRVL STREET LIGHT (# LAMPS)
- UG GRAVEL
- AG HUB & TACK
- STM UNDERGROUND
- EA ABOVE GROUND
- EA UTILITY POLE
- EA EDGE OF ASPHALT
- PK NAIL
- STP STAND PIPE
- CLF CHAIN LINK FENCE
- SURVEYED MONUMENT
- POWER POLE
- MANHOLE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY, NORTHWEST
POULSBORO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON
PROPOSED OU B PAVING SITE 1
PAVING PLAN SHEET 2

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

DIVISION: BE GACES
DRAWN: KSK
CHECKED: TDG

APPROVED
S MONTGOMERY
SP JAN

SIZE: **D**
SCALE: 1"=20'
NAVFAC. DRAWING NO.
BE 237-6

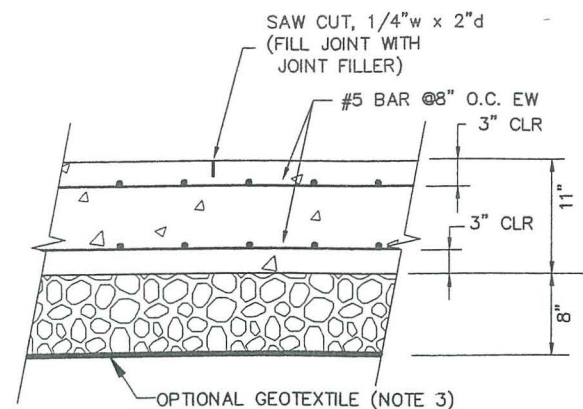
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PLOT/UPDATE: OCT 08 1998 16:03:32

NO	DATE	REVISION	BY	CH	APPROVED
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1	10/2/98	RECORD SET			SPJ/SM

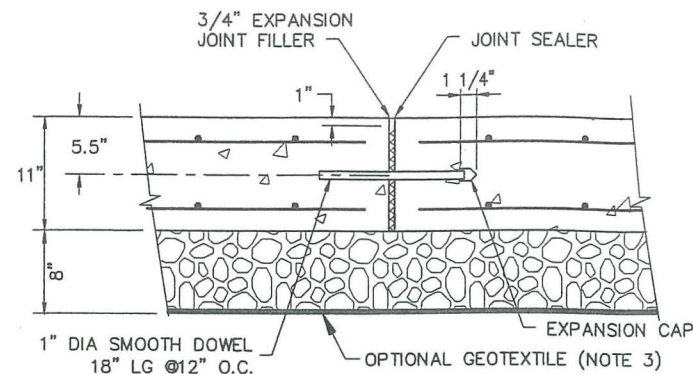
NOTES:

- SEE DRAWING BE 237-2 FOR GENERAL NOTES.
- SEE DRAWINGS BE 237-5 AND BE 237-6 FOR LOCATION OF THE VARIOUS ASPHALT CONCRETE PAVEMENT THICKNESS.
- OPTIONAL GEOTEXTILE WAS PROVIDED AS REQUIRED TO TO SEPARATE IMPORTED FILL FROM SOFT FINE GRAINED SUBGRADE OR OFFSITE FILL OR OTHER EXCAVATED MATERIAL.
- CONCRETE PAVING WAS ISOLATED FROM ALL EXISTING AND NEW STRUCTURES USING ISOLATION JOINTS.



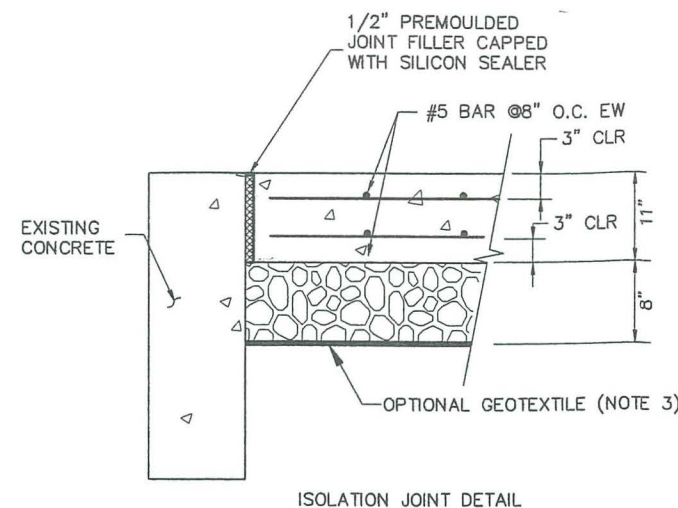
CONTRACTION JOINT DETAIL

SECTION A
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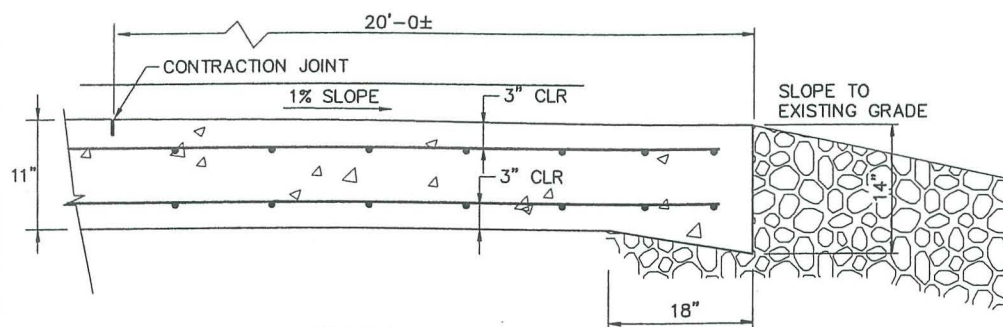
EXPANSION JOINT DETAIL

SECTION B
SCALE - 1" = 1'-0"



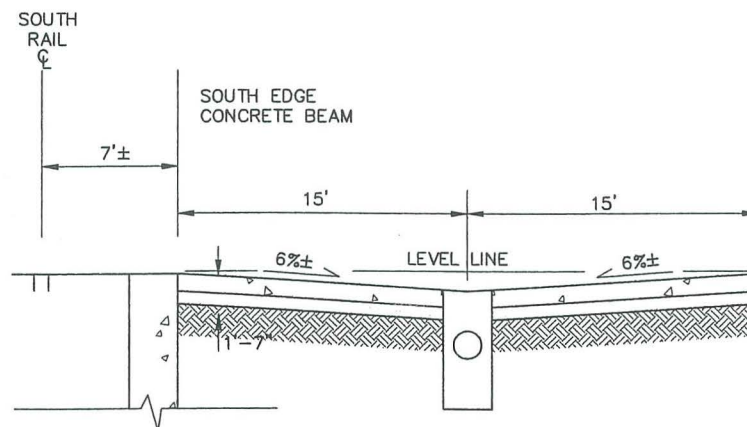
ISOLATION JOINT DETAIL

SECTION C
SCALE - 1" = 1'-0"



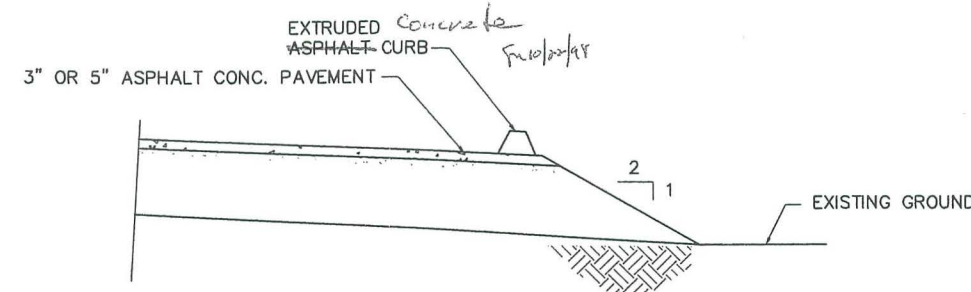
THICKENED END SECTION

SECTION D
SCALE - 1" = 1'-0"



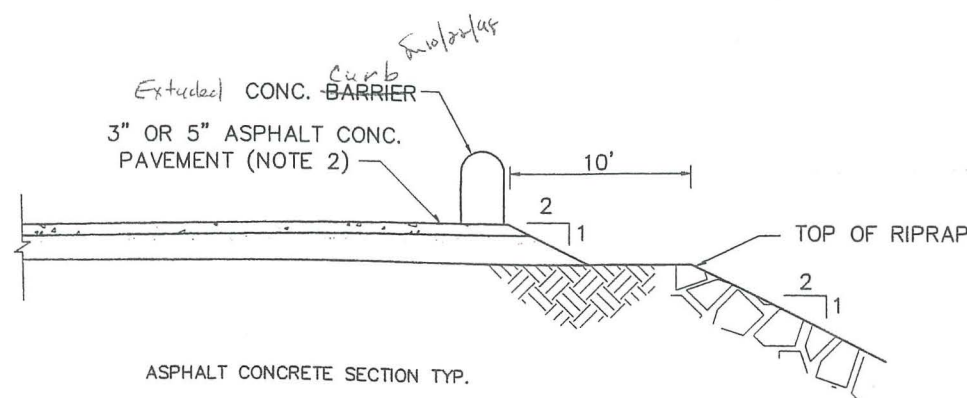
DRAINAGE SWALE

SECTION G
SCALE - 1" = 5'-0"



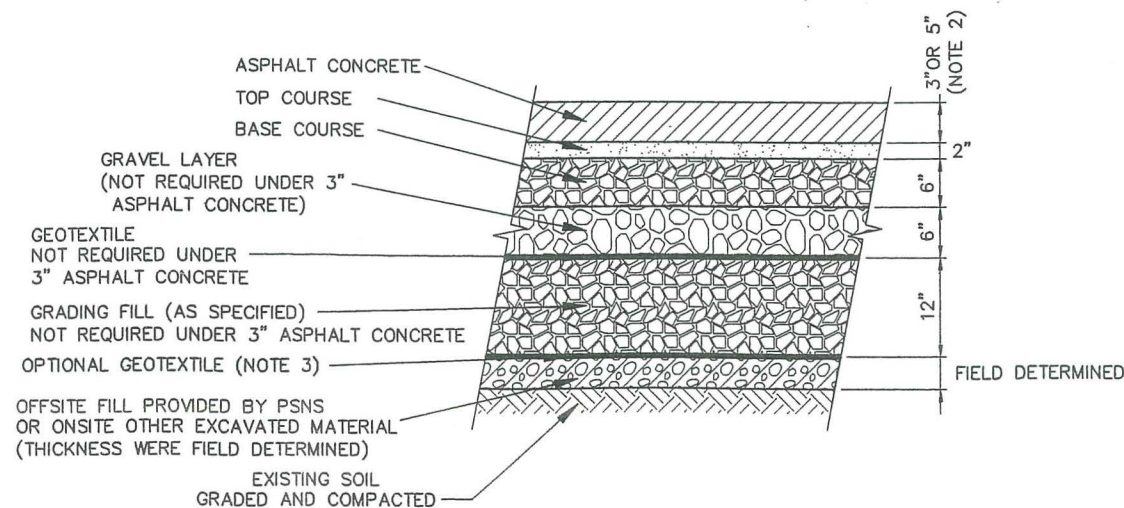
ASPHALT CONCRETE EDGE SECTION

SECTION E
SCALE - 1" = 1'-0"



ASPHALT CONCRETE SECTION TYP.

SECTION F
SCALE - 1" = 10'-0"



ASPHALT CONCRETE PAVING

SECTION H
SCALE - 1" = 1'-0"

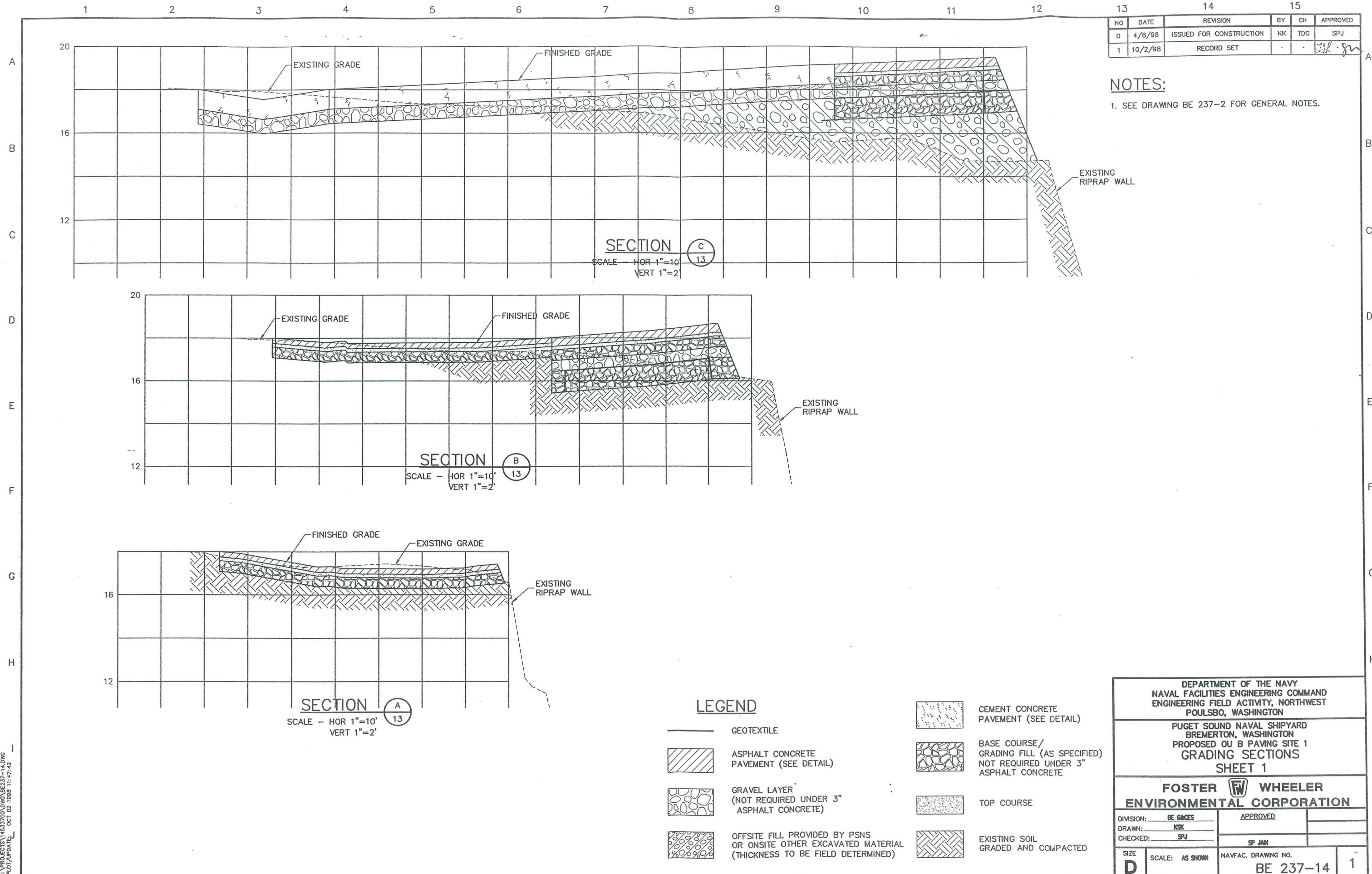
DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON					
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON PROPOSED OUB PAVING SITE 1 PAVING SECTIONS AND DETAILS					
FOSTER WHEELER ENVIRONMENTAL CORPORATION					
DIVISION:	BE CASES	APPROVED:	S MONTGOMERY		
DRAWN:	KK	CHECKED:	TDG		
SIZE	D	SCALE:	AS SHOWN	NAVAC. DRAWING NO.	BE 237-7
					1

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1	10/2/98	RECORD SET			SPJ

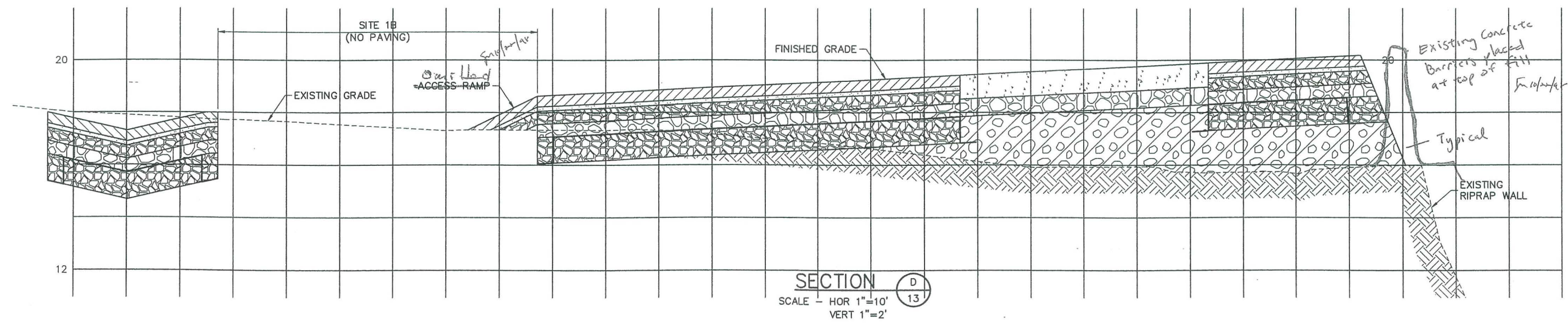
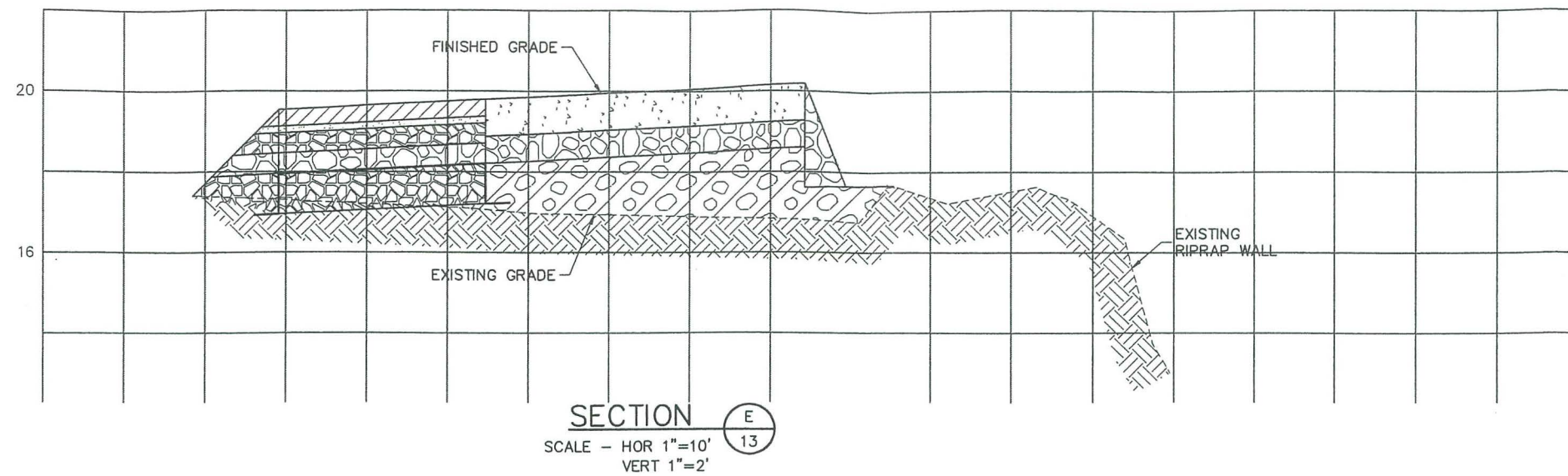
NOTES:

1. SEE DRAWING BE 237-2 FOR GENERAL NOTES.



NO	DATE	REVISION	BY	CH	APPROVED
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1	10/2/98	RECORD SET			

NOTES:
 1. SEE DRAWING BE 237-2 FOR GENERAL NOTES.
 2. See FRR-0037-003
5/10/2014



LEGEND

	GEOTEXTILE		CEMENT CONCRETE PAVEMENT (SEE DETAIL)
	ASPHALT CONCRETE PAVEMENT (SEE DETAIL)		BASE COURSE/ GRADING FILL (AS SPECIFIED) NOT REQUIRED UNDER 3" ASPHALT CONCRETE
	GRAVEL LAYER (NOT REQUIRED UNDER 3" ASPHALT CONCRETE)		TOP COURSE
	OFFSITE FILL PROVIDED BY PSNS OR ONSITE OTHER EXCAVATED MATERIAL (THICKNESS TO BE FIELD DETERMINED)		EXISTING SOIL GRADED AND COMPACTED

DEPARTMENT OF THE NAVY
 NAVAL FACILITIES ENGINEERING COMMAND
 ENGINEERING FIELD ACTIVITY, NORTHWEST
 PULSBORO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
 BREMERTON, WASHINGTON
 PROPOSED OUB PAVING SITE 1
 GRADING SECTIONS
 SHEET 2

FOSTER WHEELER ENVIRONMENTAL CORPORATION

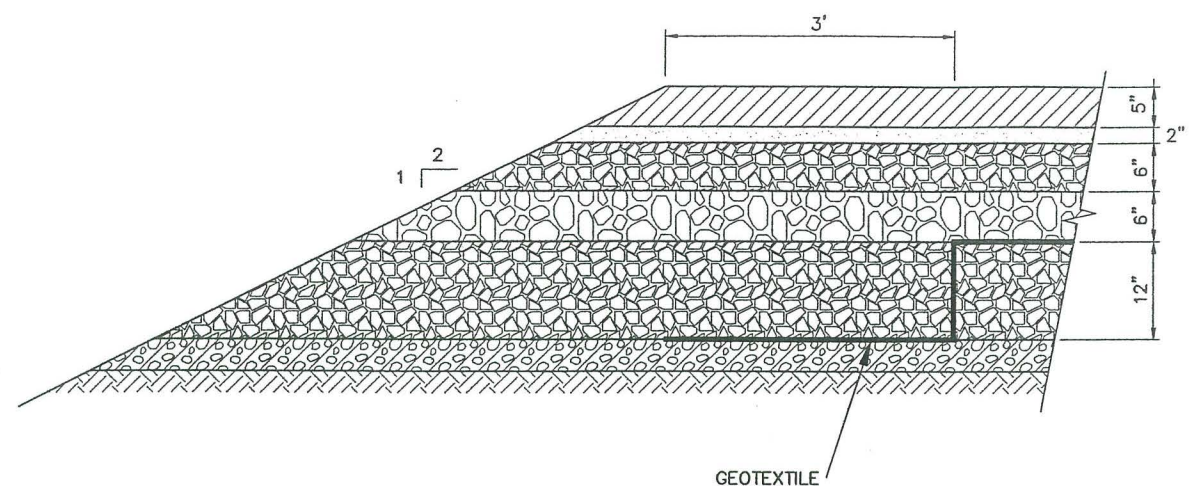
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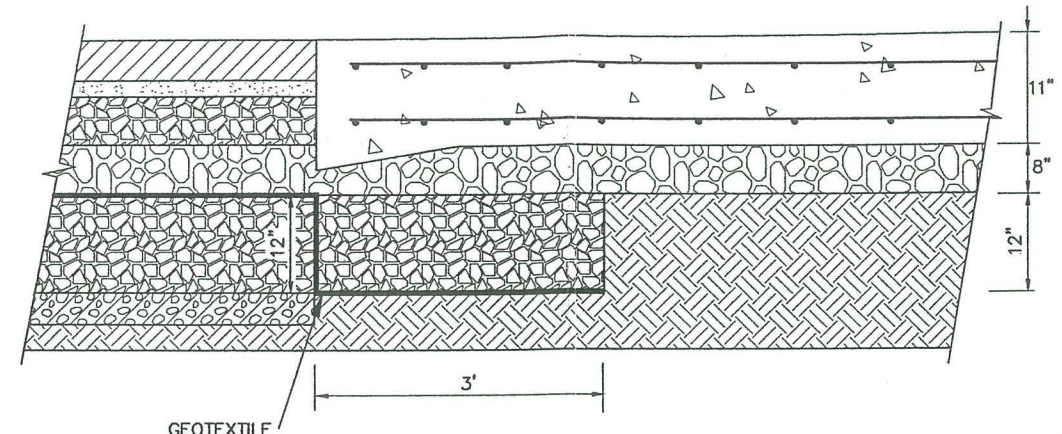
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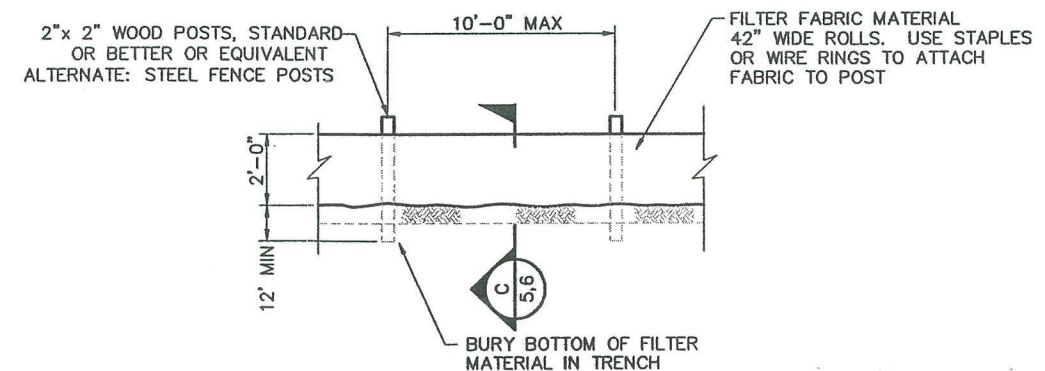
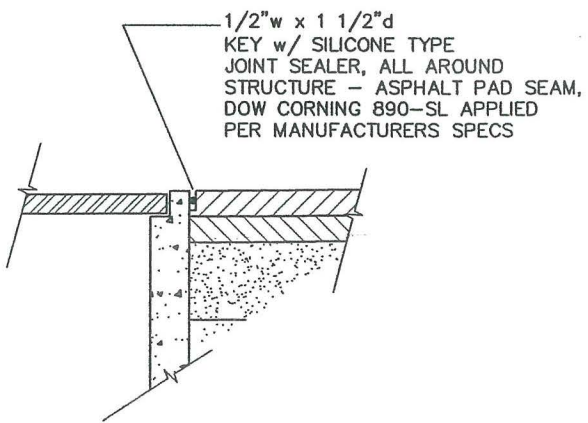
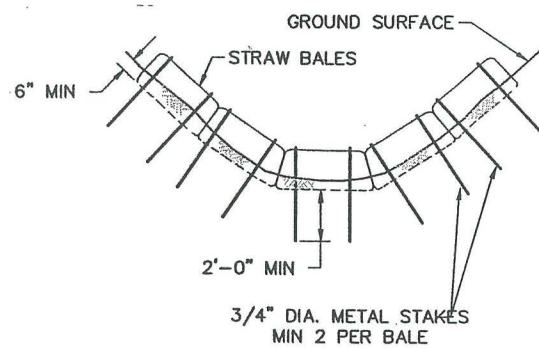
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1	10/2/98	RECORD SET	.	.	



GEOTEXTILE ANCHOR DETAIL

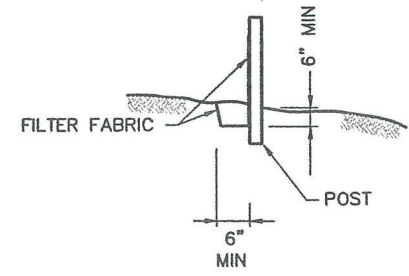


GEOTEXTILE ANCHOR DETAIL



SILT FENCE
DETAIL 2
NO SCALE

5,6



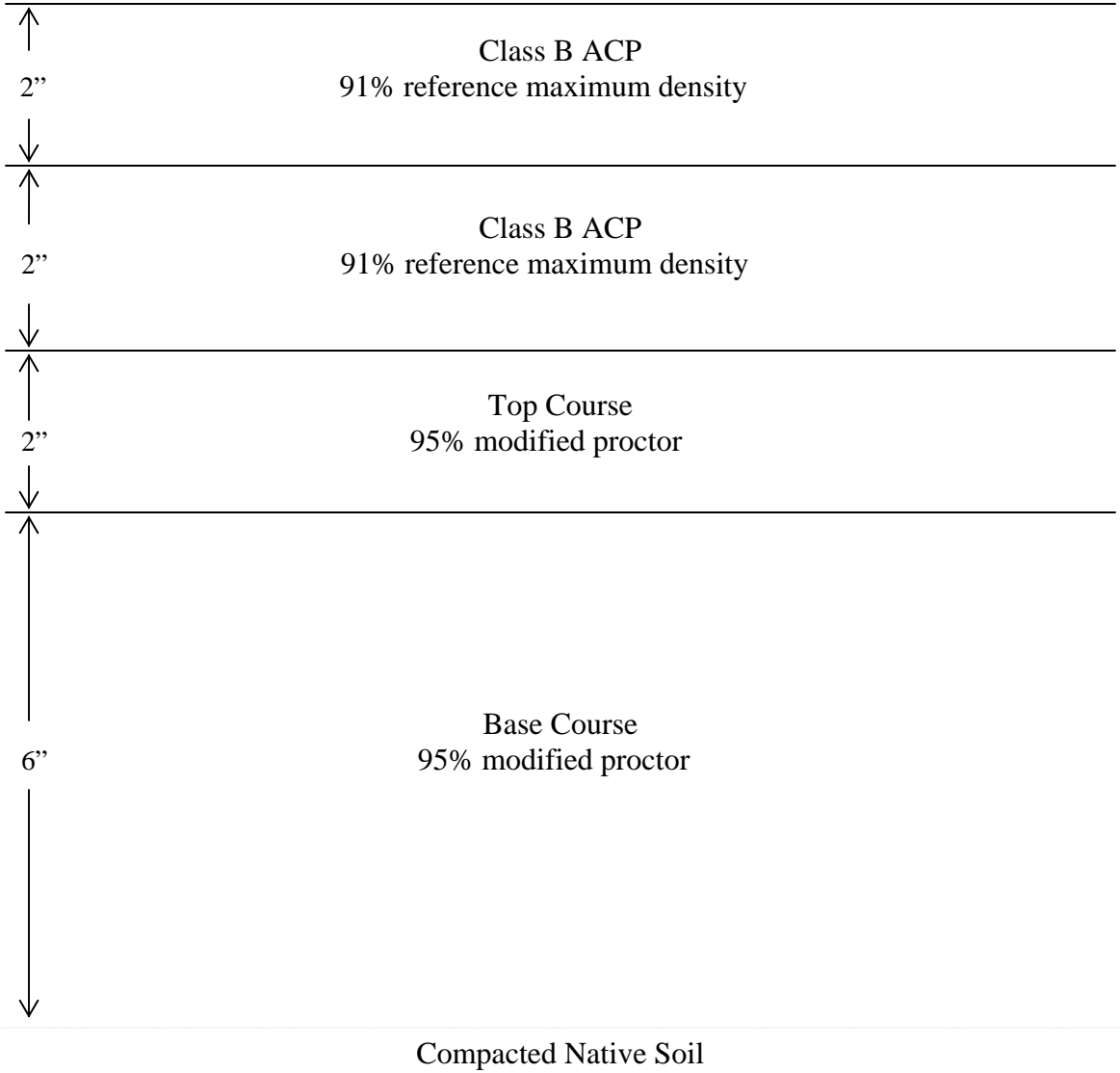
NOTES:

1. SEE DRAWING BE 237-2 FOR GENERAL NOTES.
2. SEE DRAWINGS BE 237-7 FOR THE VARIOUS LAYERS.
3. ON SITE EROSION CONTROL MEASURES WERE THE RESPONSIBILITY OF THE SITE SUPERINTENDENT AND FOLLOWED THE REQUIREMENTS OF THE ENVIRONMENTAL PROTECTION PLAN AND THE STORMWATER POLLUTION PREVENTION PLAN.
4. ALL EROSION AND SEDIMENTATION CONTROL (E&S) DEVICES SHOWN ON THIS DRAWING WERE INSTALLED PRIOR TO INITIAL SITE PREPARATION.
5. SHOULD THE TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHOWN ON THIS DRAWING NOT PROVE ADEQUATE TO CONTROL EROSION AND SEDIMENTATION, THE SITE SUPERINTENDENT SHALL INSTALL ADDITIONAL FEATURES AS NECESSARY TO PROTECT ADJACENT PROPERTIES, SENSITIVE AREAS, NATURAL WATER RESOURCES AND/OR STORM DRAINAGE SYSTEMS.

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON			
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON PROPOSED OUB PAVING SITE 1 MISCELLANEOUS SECTIONS AND DETAILS			
FOSTER WHEELER ENVIRONMENTAL CORPORATION			
DIVISION: BE CADDES	APPROVED: S MONTGOMERY		
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Area 3 – Typical Pavement Specifications

4" ACP Cross Section



Typical Asphalt Paving Cross Section

SECTION 02510

ASPHALT REPAIRS

PART 1 - GENERAL

1.01 SUMMARY

Work under this section shall include the repair of asphalt concrete paving on the prepared surface as shown on the drawings or as directed.

1.02 RELATED SECTIONS

Section 03310 Concrete

1.03 APPLICABLE STANDARDS AND SPECIFICATIONS

A. ASTM - American Society for Testing and Materials

C136-93 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

D75-87 Standard Practice for Sampling Aggregates

D2041-03a Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures

D2922-04 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

D1557-02e1 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³)

Washington State Department of Transportation (WSDOT): 2002 Standard Specifications for Road, Bridge, and Municipal Construction, M41-10. 1.03

1.04 SUBMITTALS

- A. The Manufacturer or Supplier shall submit, before or upon delivery of asphalt pavement, certificates of compliance attesting that the asphalt pavement furnished meets the requirements of this Section.

1.05 QUALITY ASSURANCE

- A. The Site QC Representative shall document all deviations from the drawings and specification requirements.

1.06 QUALITY CONTROL REQUIREMENTS

The following activities shall be performed (as required) in accordance with the requirements of the Standard Specifications for Road, Bridge, and Municipal Construction by the WSDOT.

- Temperature measurements on the as-delivered materials
- Checking of thickness
- Verification of joint methods and sealing
- Determination and implementation of compaction methodology
- Implementation of mix design
- Verification of subgrade conditions

PART 2 - PRODUCTS

2.01 BASE COURSE AND TOP COURSE

- A. Base course and top course for asphalt paving shall meet all the requirements of crushed surfacing base course and top course as specified in WSDOT Section 9-03.9(3).
- B. Sampling and testing of aggregates shall be the responsibility of the aggregate producer. Sampling and testing shall be performed by commercial testing laboratory. Testing shall be performed in accordance with ASTM C 136-93. Tests shall be performed in sufficient number to ensure that materials meet specified requirements. Copies of test results shall be furnished to the Site QC Representative.
- C. Sources of aggregates shall be selected well in advance of the time the material will be required for the work. An inspection of the producer's operation may be made by the Site Supervisor. Inspection of aggregate source does not relieve the producer of responsibility for delivery of aggregates that meet requirements specified herein.

2.02 AGGREGATES FOR ASPHALT CONCRETE

- A. Aggregates for the asphalt concrete shall meet the requirements of Class B asphalt concrete aggregate as specified in WSDOT Section 9-03.8.
- B. Sampling and testing of aggregates shall be the responsibility of the aggregate producer. Sampling and testing shall be performed by commercial testing laboratory, subject to approval of the Site QC Representative. Aggregate gradations shall comply with WSDOT Section 9-03.8 Class B asphalt concrete unless otherwise directed. Test results shall be performed in accordance with ASTM C 136-93. Tests shall be performed in sufficient number to ensure that materials meet specified requirements. Copies of test results shall be furnished to the Site QC Representative.

- C. Sources of aggregates shall be selected well in advance of the time the material will be required for the work. An inspection of the producer's operation may be made by the Site QC Representative. Inspection of aggregate source does not relieve the producer of responsibility for delivery of aggregates that meet requirements specified herein.

2.03 BITUMINOUS MATERIALS

- A. Asphalt cement shall conform to viscosity grade AR-4000W as specified in WSDOT Section 9-02.1(4).
- B. Prime Coat: Emulsified asphalt shall conform to CMS-2, CSS-1, or CSS-1h as specified in WSDOT Section 9-02.1(6).
- C. Emulsified asphalt for the tack coat shall conform to ASTM D997 and D2397, Grades SS-1, SS-1h, CSS-1, CSS-1h, RS-1 or CRS-1.

2.04 ASPHALT CONCRETE PAVEMENT

- A. Asphalt concrete pavement shall meet the requirements of WSDOT Section 5-04.
- B. The bituminous plant shall be of such capacity to produce the quantities of hot-mixed asphalt mixtures required for the project. Hauling equipment, paving machines, rollers, miscellaneous equipment, and tools shall be provided in sufficient numbers and capacity and in proper working condition to place the paving mixtures at a rate equal to the demands of the work.

2.05 CRACK FILLING COMPOUNDS

- A. Final surface repair of cracks in asphalt paving surfaces shall be by filling with Durafill™ or an equivalent asphalt crack-filling compound. Crack filler shall be applied according to the manufacturer's specifications.

PART 3 - EXECUTION

3.01 WEATHER LIMITATIONS

- A. If repairs require application of a prime coat, it shall be applied when the surface to receive the prime coat is dry. Prime coat shall be applied only when the temperature has not been below 35°F for the 12 hours prior to application.
- B. Asphalt courses shall not be constructed on any wet surfaces. Asphalt courses shall be constructed when temperature of the top course is 35°F or higher.

3.02 CONDITION OF BASE COURSE AND TOP COURSE

- A. Base and Top Course: Base and top course shall be compacted to a minimum of 95% of maximum dry density at not less than 2% below or more than 2% above the optimum moisture content as determined by ASTM D 1557. A sufficient number of tests shall be performed to establish the level of compaction effort required to achieve the necessary density using the method described in ASTM D 2922-04. When testing determines the

minimum level of compaction effort required, periodic verification testing shall be performed at the discretion of the Site QC Representative.

- B. Preparation of Surface: All loose materials, clay, dirt, or other objectionable material shall be removed from the final subgrade surface. To assure a uniform spread of the bituminous material, the final subgrade surface, if excessively dry, shall be sprinkled with water immediately before paving.

3.03 GRADE CONTROL

- A. Asphalt pavement shall match existing grade where repaired paving abuts existing asphalt pavement, concrete pavement or existing facilities.

3.04 TRANSPORTATION

Transportation of asphalt pavement mixtures from mixing plant to site shall be in trucks having tight, clean, and smooth beds coated with the least quantity of concentrated solution of hydrated lime and water to prevent adhesion of mixture to truck bodies. Each load of mixture shall be covered with canvas or other suitable material of ample size to protect mixture from weather and reduce heat loss. The mixture shall be delivered in such a manner that temperature at time of dumping into spreader will not be less than specified. Loads that have crusts of cold, unworkable material or have become wet by rain will be rejected. Hauling over freshly placed material will not be permitted.

3.05 TACK COAT

- A. The slow-setting emulsion shall be diluted by adding an equal amount of water. The rapid-set emulsions shall not be diluted. The tack coat shall be applied as specified in WSDOT Section 5-04.3(5)A. The exact quantities within the ranges specified may be varied to suit the field conditions.

3.06 PLACEMENT

- A. Spraying of Contact Surfaces of Structures: Contact surfaces of previously constructed pavements, curbs, manholes, catch basins, precast concrete vaults, and similar structures shall be sprayed with a coat of bituminous tack coat material conforming to the material and application requirements of WSDOT Section 5-04.3(5)A of the WSDOT Standard specifications.
- B. General Requirements for Use of Mechanical Spreader: Asphalt mixtures having temperatures less than 225°F when dumped into a mechanical spreader will be rejected. If a mechanical spreader is used, it shall be adjusted and speed regulated so that the surface of the course will be smooth and continuous without tears and pulling, and of such depth that, when compacted, surface will conform with cross-section, grade, and contour indicated. Mixture shall be placed in consecutive adjacent strips. Longitudinal joints and edges shall be constructed to true line markings. The Contractor shall establish lines parallel to the centerline of area to be paved and shall place stringlines coinciding with established lines for spreading machine to follow. Placement of

mixture shall be as nearly continuous as possible; speed of placement shall be adjusted to permit proper compaction.

- C. Paving thickness: Asphalt repairs shall be a minimum four-inch thickness, consisting of two, two-inch lifts.

3.07 COMPACTION

- A. Compaction shall be per the requirements of WSDOT Section 5-04.3(10)A.
- B. In areas of repaired pavement which are not large enough to accommodate conventional smooth drum rollers, asphalt repairs shall be compacted by making three slow passes over the area utilizing a vibratory plate compactor (or equivalent), waiting 10 to 15 minutes to allow asphalt to cool, and making two additional slow passes.
- C. In areas of repaired pavement large enough to accommodate vibratory compaction equipment (minimum 1-ton roller), asphalt repairs shall be compacted to 91% of the maximum theoretical density for bituminous paving mixtures as determined by ASTM D 2041-03a.
- D. After final compaction of the pavement, no vehicular traffic of any kind shall be permitted for at least 6 hours to allow the pavement to cool and harden.

3.08 JOINTS

- A. Joints between asphalt concrete courses shall be staggered except at edges. The surface against which new material is placed shall be sprayed with a uniform coat of tack coat material conforming to the requirements of Paragraph 3.05 – Tack Coat.
- B. Edge of Pavement: Edges shall be trimmed neatly to line.
- C. Where asphalt and concrete paving abut, the edge of the existing concrete and/or asphalt shall be straight. A tack coat shall be applied prior to placing the new material next to the existing material. After paving, joints between the new pavement and the edges of all previously constructed pavements, curbs, etc. shall be sealed with a liquid asphalt emulsion.

3.09 SURFACE REQUIREMENTS

Upon completion, the pavement surface shall be smooth and true to grade and cross-section. When a 10-foot straightedge is laid on the surface, the surface shall not vary more than $\frac{1}{4}$ inch from straightedge. Areas which experience cracks or tearing will be considered defective. Low or defective areas shall be immediately corrected by cutting out faulty areas and replacing with fresh, hot mixture and compacting area to conform to remainder of pavement. High areas shall be repaired by grinding with an approved grinding machine or by removal and replacement as described above.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. This section describes the requirements for the materials, fabrication, handling, placement, and testing of concrete reinforcement.
- B. The Work under this Section shall include the designing, furnishing, and installing of reinforcement for the Portland cement concrete pavement and any additional concrete at the Bremerton Naval Complex.
- C. It is not the intent of this Section and associated drawings when available to specify all details of design, fabrication, and construction. It shall be the responsibility of the installer to provide equipment and systems that have been designed, fabricated, and equipped in accordance with stated standards and high standards of engineering and workmanship that are suitable for the specified services.

1.02 APPLICABLE CODES AND STANDARDS

This Work shall comply with the latest edition of the codes and standards listed below in addition to any State and Local Ordinances.

- A. ACI - American Concrete Institute
 - ACI 318 - Building Code Requirements for Reinforced Concrete
- B. ASTM - American Society for Testing and Materials
 - ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
 - ASTM A 184 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
 - ASTM A 185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
 - ASTM A 497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
 - ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- C. CRSI - Concrete Reinforcing Steel Institute
 - Manual of Standard Practice

1.03 SUBMITTALS

- A. The Manufacturer or Supplier shall submit, before or upon delivery of concrete reinforcement, certificates of compliance attesting that the concrete reinforcement furnished meets the requirements of this Section.

1.04 QUALITY ASSURANCE

- A. The Site QC Representative shall document all deviations from the drawings and specification requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel Welded Wire Fabric shall conform to ASTM A 185 or A 497, with a minimum 6X6 wire mesh.
- B. Structural concrete shall be as specified in Section 03310, Concrete.
- C. Reinforcement for the cement concrete pavement, slabs, and pads may be either reinforcing steel bars conforming to ASTM A615 Grade 60 (60,000 psi minimum yield) or flat sheets of welded wire fabric conforming to ASTM A185 (minimum yield strength of 65,000 psi).

PART 3 - EXECUTION

3.01 FABRICATION

- A. Reinforcement shall be fabricated in accordance with the requirements of ACI 318. Reinforcement shall be cold bent unless otherwise authorized. Bending may be accomplished in the field or at the shop. Bars shall not be bent after embedment in concrete.
- B. Bar supports for formed surfaces shall be designed and fabricated in accordance with CRSI Manual of Standard Practice and shall be steel or precast concrete blocks.

3.02 INSTALLATION

- A. Reinforcement shall be free from loose rust and scale, dirt, oil, or other deleterious coating that could reduce bond with the concrete. Reinforcement shall be placed in accordance with ACI 318 at locations shown plus or minus one bar diameter.
- B. Splices of reinforcement shall conform to ACI 318 and shall be made only as required or indicated. Splicing shall be by lapping or by mechanical connection; except that lap splices shall not be used for bars larger than No. 11 unless otherwise indicated. Welding shall not be performed. Lapped bars shall be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lapped bars shall not be spaced farther apart than one-fifth of the required length of lap or 6-inches. Mechanical butt splices shall be in accordance with the recommendation of the manufacturer of the mechanical splicing device.
- C. Lap splices in welded wire fabric shall be made in such a way that the overlapped area equals the distance between the outermost crosswires plus 2 inches. Laps shall be staggered to avoid continuous laps in either direction. Fabric shall be wired or clipped together at laps at intervals not to exceed 4 feet. Fabric shall be positioned by the use of supports.
- D. Dowels shall be installed at locations indicated on the drawings and at right angles to joint being doweled. Dowels shall be accurately aligned parallel to the finished concrete

surface and rigidly supported during concrete placement. One end of dowels shall be coated with a bond breaker.

- E. All Work shall be performed by competent, trained workers, skilled in the field in which they are executing the Work.
- F. Anchor bolts and embedded plate material shall be in accordance with the design drawings.
- G. Formwork shall be the responsibility of the contractor and shall be designed and constructed in accordance with Section 03310, Concrete.

END OF SECTION

SECTION 03310
CONCRETE REPAIRS

PART 1 - GENERAL

SUMMARY

- A. This Section covers the requirements for the materials, performance, placement, testing, quality, and handling of the concrete described herein.
- B. The Work under this Section shall include repair of Portland cement concrete pavement and any additional concrete repairs at the Bremerton Naval Complex.
- C. It is not the intent of this Section and associated drawings when available to specify all details of site design, fabrication, and construction. It shall be the responsibility of the installer to provide equipment and systems that have been designed, fabricated, and equipped in accordance with stated standards and high standards of engineering and workmanship that are suitable for the specified services.

1.02 RELATED SECTIONS

Related work and/or equipment that is specified in other sections of the contract documents includes but is not limited to the following:

Section 03200 - Concrete Reinforcement

1.03 APPLICABLE STANDARDS AND SPECIFICATIONS

- A. All Work shall comply with the latest edition of the codes and standards below in addition to State and Local Ordinances.

ACI - American Concrete Institute

301 - Specifications for Structural Concrete for Buildings

305R - Hot Weather Concreting

306R - Cold Weather Concreting

318 - Building Code Requirements for Reinforced Concrete

ASTM - American Society for Testing and Materials

C 33 - Standard Specification for Concrete Aggregates

C 31-84 - Standard Method of Making and Curing Concrete Test Specimens in the Field

C 39-83b - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

C 94 - Standard Specification for Ready-Mixed Concrete

C 150 - Standard Specification for Portland Cement

1.04 SUBMITTALS/SAMPLES

- A. The concrete supplier shall submit a design mix to the Site QC Representative for approval two days prior to the start of the Concrete Work.
- B. Concrete supplier shall furnish the following documents for the site records:
 - 1. A Certificate of Compliance stating the following: "All concrete supplied under this specification complies with the requirements of this specification and accepted deviations".
 - 2. Documents identifying deviations and their acceptance.

1.05 QUALITY ASSURANCE

- A. The Site QC Representative shall have sufficient access to the batch plant facility prior to production of the concrete for in-process and final plant inspections, as required.
- B. All concrete shall be placed in accordance with the codes and standards listed in Section 1.03.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel reinforcement shall be as specified in Section 03200.
- B. Final surface repair of cracks in concrete paving surfaces shall be filled with Durafill™ or an equivalent crack-filling compound.
- C. Concrete
 - 1. Concrete shall be proportioned for workability, maximum density, strength, and durability requirements in accordance with Chapter 3 of ACI 301. The 28-day design compressive strength of cement concrete pavement shall be 4,000 psi with a minimum strength of 1,800 psi at 3 days.
 - 2. Production of concrete shall conform to Chapter 7 of ACI 301.
 - 3. Concrete materials shall conform to the requirements of Chapter 2 of ACI 301 and the following:
 - a. Cement shall be an established commercial brand of Type II Portland Cement conforming to ASTM C 150.
 - b. Coarse Aggregate shall be normal weight concrete aggregates conforming to ASTM C 33.
 - c. Fine Aggregate shall be as defined in ASTM C 33.
 - d. Water shall be free from any injurious amounts of acid, alkali, salts, oil, sediment, or organic matter.
- D. Formwork

Formwork shall be the responsibility of the installer and shall be designed and constructed in accordance with Chapter 4 of ACI 301.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. All Work shall be performed by competent, trained workers, skilled in the field in which they are executing the Work.
- B. The Work shall include, but not necessarily be limited to, furnishing and placing reinforcing steel and embedded material, and furnishing, delivering, testing, placing, finishing, and curing concrete.
- C. Material and services furnished shall be in accordance with the codes and standards listed. Later editions may be used.
- D. In addition to the above codes and standards, all work shall comply with the State and Local Ordinances, Laws, and Regulations.
- E. In the event of an apparent conflict among codes, standards, or this specification, the contractor shall refer the conflict to the Navy for written resolution.
- F. Concrete shall be installed to depth to match existing slab edges. Concrete repairs shall be placed and cured in accordance with Chapters 8 through 12 of ACI 301 and formwork placing tolerances shall be in accordance with Chapter 4 of ACI 301.
- G. When hot weather conditions prevail (dry bulb temperature equals or exceeds 85°F), the interval between mixing and placing shall not exceed 60 minutes and the provisions of ACI 305R shall be followed.
- H. When cold weather conditions prevail, the concrete shall be protected from freezing and the provisions of ACI 306R shall be followed.
- I. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or floating. Placement shall be carried on at such a rate that the concrete is at all times plastic and flows readily. No concrete that has partially hardened or has been contaminated by foreign material shall be deposited on the Work, nor shall retempered concrete be used.
- J. Once placement has started, it shall be carried on as a continuous operation until the placing of the structure is completed in such a manner that fresh concrete will not be deposited on concrete which has hardened sufficiently to cause formation of seams and places of weakness within the section.
- K. All concrete shall be placed upon clean, damp surfaces, free from running water, dry porous earth, or fills that have not been properly compacted.
- L. After the concrete has been placed, it shall be screeded with straight edges. While the concrete is still green but hardened sufficiently to bear a person's weight without deep imprint, the surface shall be uniformly smoothed such that no coarse aggregate is visible.
- M. Control joints in cement concrete pavement shall be constructed per the requirements of WSDOT Standard Specifications, Paragraph 5-05.3(8)B, at a maximum spacing of 15 feet in each direction or in accordance with the dimensions indicated on the drawings. Joints shall be saw cut after the concrete has hardened sufficiently to prevent tearing or

raveling of the concrete at the edges, but before shrinkage occurs and uncontrolled cracking takes place. All joints shall be thoroughly cleaned of cutting debris and sludge.

- N. Expansion joints with dowels, expansion joint filler, and joint sealer shall be constructed in each direction as indicated on the drawings when available and per the requirements of the WSDOT Standard Specifications, Paragraphs 5-05.3(8)A-C.
- O. Isolation joints with expansion joint filler and joint sealer shall be constructed as indicated on the drawings when available and per the requirements of the WSDOT Standard Specifications, Paragraphs 5-05.3(8)A-C.
- P. All completed surfaces of the cement concrete pavement shall be broom finished.
- Q. Crack filler shall be applied according to the manufacturer's specifications.

3.02 MATERIAL TESTS

Concrete shall be tested at the discretion of the Navy. If testing is required, 3-day, 7-day, and 28-day compressive strength testing of concrete shall be performed in accordance with ASTM C 39/C 39M-03, where applicable. Preparation and curing of concrete test specimens in the field shall conform to ASTM C 31/C 31M-03a, where applicable.

END OF SECTION

ARMOR MANUFACTURING CO.

A-420 'DURA-FILL' HEAT STABILIZED CRACK FILLER

PRODUCT DATA BULLETIN



PRODUCT: Dura-Fill H.S. heat stabilized formula for direct fired kettles. This low penetration, self leveling, rapid melting crack filler is flexible to 0° F, and stays resistant to tracking even at elevated temperatures.

Dura-Fill H.S. is a specialty grade, premium quality joint and crack sealing compound, specifically formulated for direct fired heaters, because it is heat stabilized. The heat stabilized formula will withstand temperatures up to 550°F without experiencing degradation. Conventional sealants must be melted in oil jacketed heating kettles which have longer melting times and are more expensive than direct fired heaters.

Dura-Fill H.S. is unique in that it is 100 % asphalt and Thermo Plastic Rubber. Since it does not incorporate crumb rubber, its specific gravity or weight per gallon, is greater than other hot pour crack fillers.

USES: Dura-Fill H.S. is recommended for sealing of joints and cracks in Portland cement and asphaltic pavements and parking lots. It is designed to seal expansion and contraction joints, longitudinal and traverse cracks, joints between concrete and asphaltic shoulders and random cracks. Dura-Fill H.S. is relatively hard and has a high softening point which makes it well suited for use on parking lots. It needs no sanding, sets up quickly and is firm under pedestrian traffic.

PRODUCT DATA:

Crumb Rubber Content.....	None
Thermo Plastic Rubber Content.....	10%
Recommended Application Temp.....	350°-400°F
Pour Temp. Range.....	280°-450°F
Maximum Heating Temp.....	450°F
Bond @ 0°F (1" mandrel).....	pass
Penetration (150 gr/5 sec.).....	50 Max.
Softening Point.....	200° F Min.
Resiliency.....	60% Min.
Specific Gravity.....	1.02
Weight Per Gallon.....	8.60 Lbs. Per Gallon Min.
Asphalt Compatibility.....	Compatible

PACKAGING: Dura-Fill H.S. is packaged in 2-25 lb. poly-bags in a 50 lb. high strength corrugated box. Each pallet contains 36 boxes or approximately 1,800 lbs. of Dura-Fill.

APPLICATION: See reverse side for application instructions.

**ARMOR MANUFACTURING CO. DURA-FILL A-420
HEAT STABILIZED CRACK FILLER PRODUCT DATA BULLETIN**

PREPARATION: Proper surface preparation will facilitate adequate adhesion and consequently the maximum service life of the sealant. In order for proper adhesion, the crack must be free of moisture, dust, loose aggregate, or other contaminants. The substrate and air temperatures must be 40°F or above. Compressed air, routing or power driven brush cleaners are the preferred methods of preparation. Joints should be sized so that the maximum extension and compression does not exceed 50% of the width. Best results are obtained when sealant depths to width ratios do not exceed 2 to 1 and the joints are opened to at least 1/2 inch wide.

APPLICATION: Dura-Fill H.S. may be melted in direct fired or oil jacketed kettles. The heat stabilized formula can withstand temperatures up to 550°F.

Carefully insert small quantities of H.S. and the plastic bag into the melting equipment while the agitator is turned off. Load the material slowly to avoid splash back. After the initial load has reached the recommended pouring temperature, fresh material may be added to the melter as sealant is used. Melt only the amount of material that will be used the same day. Sealer can be applied using a pressure feed wand system or through a pour pot. Melters equipped with hydraulic pressure material lines should purge any material remaining in the lines at the end of each sealing operation. Material remaining in the melter may be reheated as required. Applied sealer should be followed up with an application squeegee before it is cured so as to insure material penetration and even appearance.

COVERAGE:	WIDTH	DEPTH	POUND/100 LINEAL FEET
	3/8"	3/8"	6.2
	3/8"	1/2"	8.3
	1/2"	1/2"	11.1
	1/2"	1"	22.2
	3/4"	1/2"	16.6
	3/4"	3/4"	25.0

CAUTION: Note: The temperature of the heat transfer oil should not exceed 525°F. Do not heat Dura-Fill H.S. above the maximum heating temperature or do not maintain it at that temperature for prolonged periods of time (6 hours). This could cause the material to gel in the equipment or fail in the joints. A significant viscosity increase accompanied by stringiness signals the approach of gelatin. If this occurs, immediately remove the material from the melter and dispose of it.

SHORELINE SPECIFICATIONS

- **Segments 1, 2, 3, 4, 17, and 40**
- **Segments 18 and 19**
- **Segment 41A and 41B**
- **Segment 42**
- **Segment 43**
- **Segment 44**

Segments 1, 2, 3, 4, 17, and 40

SECTION 02270

EROSION CONTROL SYSTEM

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

The work includes furnishing all material, labor and equipment necessary for providing the erosion control and habitat restoration features consisting of armor rock, filter rock, rat rock, fish mix, and geotextile fabric at the locations shown on the design drawings and described in this specification.

1.02 APPLICABLE PUBLICATIONS

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. American Society for Testing and Materials (ASTM)

ASTM C 127 Specific Gravity and Absorption of Coarse Aggregate
ASTM C 136 Test Method for Sieve Analysis for Fine and Coarse Aggregate
ASTM C 535 Resistance to Degradation of Large-Size Coarse Aggregate by
Abrasion and Impact in the Los Angeles Machine

C. American Association of State Highway and Transportation Officials (AASHTO)

M288-96 Geotextile Specifications for Paving Fabrics

D. Washington State Department of Transportation (WSDOT)

WSDOT 113 Degradation Factor

1.03 SUBMITTALS

Submit test reports \leq 9 months old for materials as required in Sections 2.03 and 2.04.

1.04 CONSTRUCTION FACILITIES

If material is barged to the site, navigation aids and lights for all marine equipment or facilities shall be installed and maintained as required by and in a manner satisfactory to the U.S. Coast Guard.

PART 2 - PRODUCTS

2.01 MATERIAL SOURCES

Armor rock, fish mix, rat rock, and filter rock shall be selected materials from an existing commercial source meeting the quality requirements specified below.

2.02 GENERAL REQUIREMENTS

All rock except fish mix shall be sound, clean, angular, durable stone. The longest dimension of any stone shall not exceed three times its shortest dimension. Fish mix shall be a round or sub-angular river sandy gravel. Acceptability of stones will be determined by laboratory tests, as hereinafter specified, geologic examination, and service records.

2.03 EVALUATION TESTING

The Subcontractor shall submit to the TtFW Representative all pertinent test results and service records from the proposed source. All testing shall be conducted by a laboratory that is independent of the material supplier. These test results shall be recent (less than 9 months old). The tests shall be performed in accordance with, and meet the requirements of Paragraph 2.04 (Rock Quality) below. Satisfactory Subcontractor documentation of laboratory test results on rock samples will not constitute approval of all rock in the quarry and will not in any way change the Subcontractor's responsibility for obtaining and developing a satisfactory source of rock. In addition, the Subcontractor shall also provide access for the TtFW Representative to examine the material at the source. Throughout the duration of this work, the TtFW Representative may conduct periodic inspections at the quarry and/or visual inspections of the rock delivered to the work site and proposed for use in the construction. Rock failing to meet the specified requirements will be removed from the jobsite by the Subcontractor at their cost.

2.04 ROCK QUALITY

- A. Import material shall be from approved sources. Prior to any on-site placement of import materials, the Subcontractor shall submit test results to the TtFW Representative for approval.
- B. Armor rock shall be solid, durable, free from cracks, fractures and other defects tending to destroy its resistance to weather and wave action.
- C. For each import materials, except armor rock, the Subcontractor shall provide one sieve analysis in accordance with American Society of Testing and Materials (ASTM) C 136 [Test Method for Sieve Analysis of Fine and Coarse Aggregates]..

If a material is obtained from a different supplier than the originally tested material, additional testing will be required.

- D. Test results for all materials except armor rock and fish mix shall meet or exceed the following quality requirements. Armor rock shall meet requirements for Degradation Factor and Specific Gravity only.

Test	Requirement	Test Method
Degradation factor (material retained on 3/4-inch sieve)	15 minimum	WSDOT 113
Los Angeles Wear, 500 Rev. (material retained on 3/4-inch sieve)	30% maximum	ASTM C 535-large aggregate or ASTM C 131- small aggregate
Specific Gravity	2.5 minimum	ASTM C 127

If the armor rock, rat rock, and/or filter rock are from the same source, only one set of tests will be required per source.

2.05 ROCK GRADATION

A. Armor Rock

Armor shall conform to the following gradation requirements by type:

Small Armor Rock

Percent Passing	Typical Dimension (inches)	Weight (pounds)
0-5	4	3
10-20	6	20
40-60	8	50
80-90	11	100
100	14	200

Large Armor Rock

Percent Passing	Typical Dimension (inches)	Weight (pounds)
0-5	15	375
10-20	17	450
40-60	20	500
80-90	22	570
100	25	625

B. Filter Rock

Filter rock shall conform to the following gradation requirements:

Sieve Size	Percent Passing
1	0-5
1 ¼	10-20
1 ¾	40-60
2 ½	75-90
3	100

C. Rat Rock

Rat rock shall conform to the following gradation requirements:

Sieve Size	Percent Passing
1	0-3
1 ¾	10-20
2 ½	40-60
3	75-95
4	100

D. Fish Mix

Type 1 and Type 2 Fish Mix shall be clean, naturally occurring round or sub-angular river sandy gravel, primarily (greater than 80 percent) igneous or metamorphic rock. Individual stones shall be generally free of seams, cracks, and other defects tending to destroy its resistance to weather. Bulk material shall be free of soil, clay balls, debris, wood, organic matter, and other extraneous material. Fish mix shall be a mixture of sand and gravel meeting the following gradation requirements:

Type 1

Sieve Size	Percent Passing
#40	0-5
3/8	10-20
2 1/2	40-60
3	75-95
4	100

Type 2

Sieve Size	Percent Passing
#40	0-5
1/4	10-20
1 1/2	40-60
2	75-95
4	100

2.06 ACCEPTANCE OF ROCK MATERIALS

Materials will be inspected at the quarry and at the jobsite prior to placement. Subcontractor shall be responsible for meeting rock specifications. Materials that do not meet size or quality as previously specified will be rejected and no payment will be made regardless of any general or provisional acceptance of materials from a stockpile or quarry source.

2.07 GEOTEXTILE FABRIC

Geotextile fabric shall be 8 ounces/yard non-woven type conforming to AASHTO Specification M288-96.

PART 3 - EXECUTION**3.01 DEBRIS ON EXISTING SLOPES**

Prior to placing erosion control materials, the Subcontractor shall remove and salvage all debris (logs, metal, corrugated pipe, concrete debris greater than 2 feet in any dimension, etc.) that would prevent the rock from keying in to the existing shoreline as determined by the TtFW Representative.

3.02 PLACING OF FILTER ROCK

Filter rock shall be placed in a 1-foot blanket over areas from the base of the existing armor to elevation -6 MLLW. No slope preparation other than removal of debris will be performed, except in areas where slope cutback is required. Filter rock shall also be placed over areas where slope cutback occurs. Placing of material by methods that tend to segregate particle sizes will not be permitted. Placement shall be made in a manner that will produce a smooth blanket. The material shall be placed by starting at the bottom of the slope and working up to the top. Any displacement of filter rock by waves or tidal action shall be repaired prior to placement of the armor rock. Displacement of filter rock shall be corrected prior to covering it with armor rock.

3.03 PLACING OF ARMOR ROCK

The intent of this work is to provide a compact blanket of armor rock over the slope where shown on the drawings. Armor rock shall be placed in a manner that will produce a close-fitting and well-keyed mass of rock with minimum percentage of voids and shall be constructed to the lines, grades, and thicknesses shown. The armor rock shall be placed over the existing slope to its full course thickness in one operation and in such a manner as to avoid displacing the underlying material. Placing the armor rock by any method likely to cause segregation will not be permitted. The larger rock shall be well distributed and all the rock shall be so placed and distributed so that there will be no large accumulation or areas composed predominately of either the larger or smaller pieces of rock. Hand placing or rearranging of individual rock by mechanical equipment may be required to secure results specified above. There shall be no loose or unkeyed rocks on the slope and any unkeyed rock shall promptly be removed or repositioned. A tolerance from slope lines of minus 0 to plus 0.5 foot from top elevations and from slope lines shown on the drawings will be allowed in the finished surface.

In general, all slope protection materials shall be placed from the lower elevations to the higher elevations. Rock shall be placed the full thickness at the base and shall taper into the existing armor rock at the crest of the bank while maintaining the sloped shown on the design drawings. The desired distribution of various sizes of stones throughout the mass shall be obtained by selective loading at quarry.

3.04 PLACING OF RAT ROCK

The void spaces within the large armor rock between the base of the rock and the top of bank are to be filled with rat rock. The material is to be placed by lowering the conveyance bucket to the top of the armor layer and then opening the bucket. Material sloughing off and rolling down the slope must be minimized.

3.05 PLACING OF FISH MIX

Type 1 and Type 2 fish mix shall be placed at various shoreline locations, as shown on the design drawings.

3.06 SLOPE CUTBACK

To achieve the desired grades at the upper shoreline, some areas of the slope shall be cutback by excavation as shown on the plans. All excavation will occur only when the water level is below the area being cut. Following slope cutback, a blanket of filter rock and armor rock shall be placed to cover the exposed fill area within the same low tide cycle. An exposed excavation surface shall not be allowed to come in contact with the surface water of Sinclair Inlet.

END OF SECTION

SECTION 02805

VEGETATION

PART 1 - GENERAL

1.01 SUMMARY

This work includes the construction of an upland planting sections. Details of the installation of vegetation and creation of the plantings shall be approved prior to beginning the work. The planting section shall accommodate various types of vegetation including groundcover, shrubs, and trees.

1.02 RELATED SECTIONS

Not Used.

1.03 REGULATORY REQUIREMENTS

Not Used.

1.04 APPLICABLE STANDARDS AND SPECIFICATIONS

Not Used.

1.05 SITE PREPARATION

The planting section preparation shall include excavation and grading to accommodate the profiles and depths shown on the design drawings.

1.06 DELIVERY, STORAGE, AND HANDLING

Materials delivered to the site shall be inspected for damage, unloaded, and stored in a manner to mitigate any damage to the materials. Vegetation shall be monitored for moisture as well as heat and cold stress conditions. Vegetation stored for extended periods shall be mulched.

1.07 SUBMITTALS

Prior to beginning the work, the contractor shall submit a marked up plan sheet showing the location of the proposed plantings according to the description shown on the design drawings. Following construction, a markup of the drawings and this specification to show the as-built condition of the planting section shall be submitted.

PART 2 - PRODUCTS

2.01 SOIL MEDIUM

Soil medium for the planting area shall be as specified below:

pH:	5.5 – 7.0
Clay:	5 – 10%
Loam/Compost:	25 – 30%
Sand:	60 – 70%
Soluble salts:	600 ppm max.

The volume of soil shall be such as to provide the soil depth indicated on the plans.

2.02 SOIL AMENDMENTS

After placement, the soil shall be amended with a 100% organic 4-4-4 fertilizer. The contractor shall submit a copy of the product label showing ingredients and the MSDS for the fertilizer for approval by the Shipyard prior to use. The fertilizer should be spread evenly over the surface of the soil medium and mixed in prior to plant installation.

2.03 VEGETATION

Plant types and distribution shall be as listed and described on the design drawings.

2.04 GEOTEXTILE FABRIC

Geotextile fabric shall be 8 ounces/yard non-woven type conforming to AASHTO Specification M288-00.

PART 3 - EXECUTION

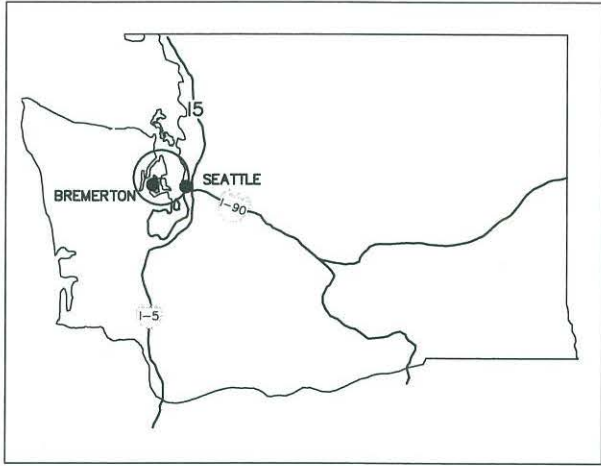
3.01 PLANTING SECTION

The planting section shall be constructed as shown on the design drawings. Excess material shall be excavated and soil medium shall be spread to the depths indicated and shaped as shown. Non-woven geotextile shall be used at the shoreward edge of the planting area to prevent the soil medium from infiltrating into the shoreline armoring. The specified vegetation shall be planted as described on the design drawings.

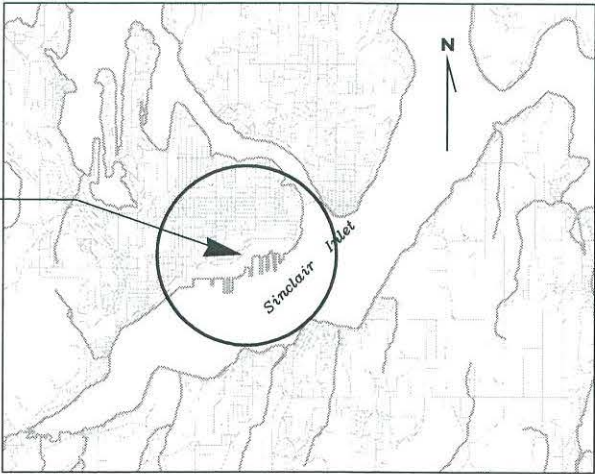
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Remedial Action Report – Erosion Control System Operable Unit B Terrestrial – Bremerton Naval Complex Bremerton, Washington

SHEET NO.	TITLE	DWG NO.
SHEET 1	TITLE SHEET, DRAWING LIST, VICINITY MAP	2597-17-AB52.DWG
SHEET 2	SEGMENT 1 – EXTENT OF ARMOR	2597-17-AB01.DWG
SHEET 3	SEGMENT 1 – SECTIONS	2597-17-AB01.DWG
SHEET 4	SEGMENT 2 – EXTENT OF ARMOR	2597-17-AB02.DWG
SHEET 5	SEGMENT 2 – SECTIONS	2597-17-AB02.DWG
SHEET 6	SEGMENTS 3 & 4 – EXTENT OF ARMOR	2597-17-AB03.DWG
SHEET 7	SEGMENTS 3 & 4 – SECTIONS	2597-17-AB03.DWG
SHEET 8	SEGMENT 17 – EXTENT OF ARMOR	2597-17-AB17.DWG
SHEET 9	SEGMENT 17 – SECTIONS	2597-17-AB17.DWG
SHEET 10	SEGMENT 40 – EXTENT OF ARMOR	2597-17-AB40.DWG
SHEET 11	SEGMENT 40 – SECTIONS	2597-17-AB40.DWG
SHEET 12	SEGMENT 40 – SECTIONS	2597-17-AB40.DWG
SHEET 13	SEGMENTS 41A AND 41B PLAN VIEW	2597-17-GL41.DWG
SHEET 14	SEGMENTS 41A AND 41 B SECTIONS	2597-17-GL41.DWG
SHEET 15	SEGMENT 2 – REVEGETATION AREA	2597-17-AB51.DWG
SHEET 16	SEGMENTS 3 AND 4 – REVEGETATION AREA	2597-17-AB51.DWG
SHEET 17	SEGMENTS 2, 3, AND 4 – REVEGETATION SECTIONS	2597-17-AB51.DWG
SHEET 18	SEGMENT 4 – REVEGETATION SECTION	2597-17-AB51.DWG

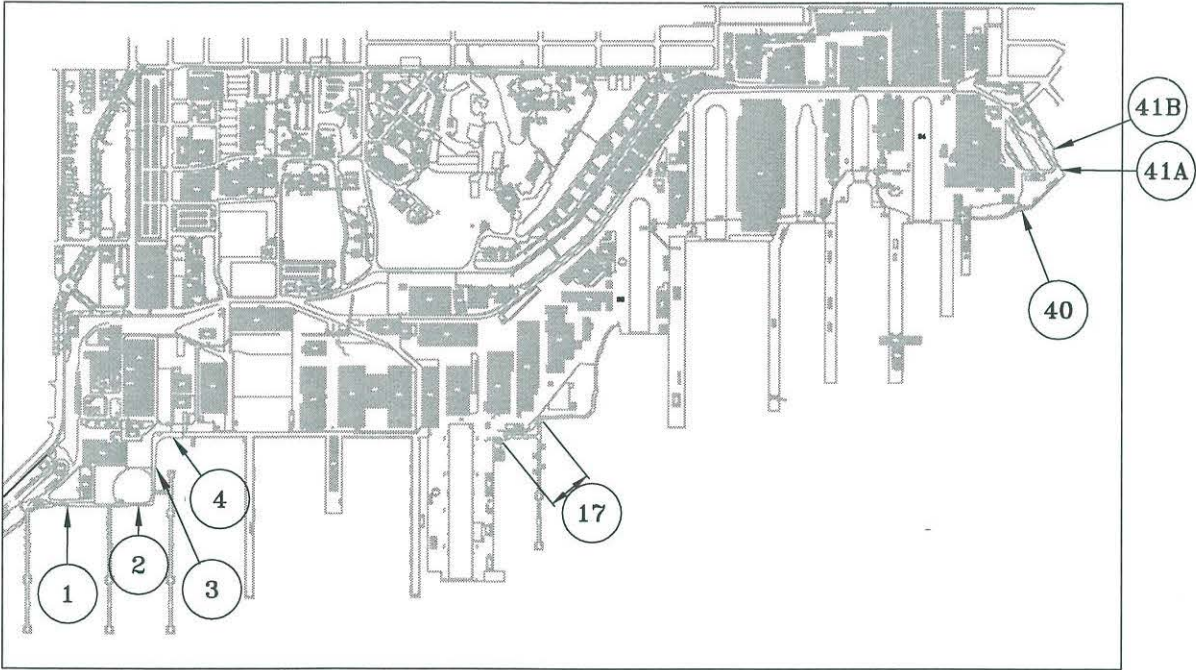


KEY MAP



BREMERTON NAVAL
COMPLEX

VICINITY MAP (NTS)



SITE LOCATION MAP

RECORD
DRAWING

DRAWING REDUCED
HALFSIZE

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NAVAL FACILITIES ENGINEERING COMMAND NORTHWEST
POULSBORO, WASHINGTON

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
TITLE SHEET, DRAWING LIST &
VICINITY MAP



TETRA TECH EC, INC.

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CHECKED: AB

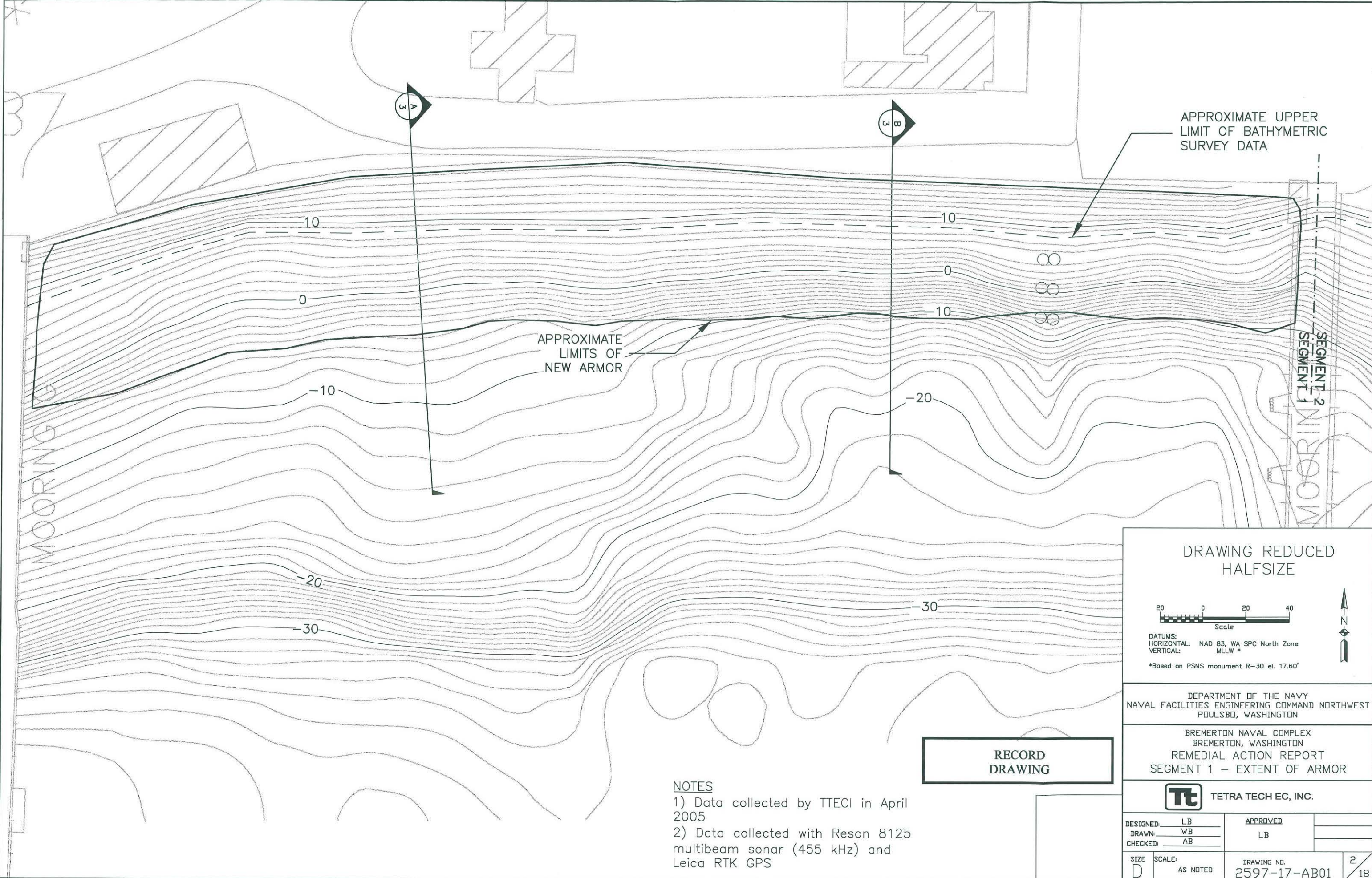
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2597-17-AB52

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NOTES
1) Data collected by TTECI in April 2005
2) Data collected with Reson 8125 multibeam sonar (455 kHz) and Leica RTK GPS

RECORD
DRAWING

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HALFSIZE

200 0 20 40

Scale

DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *

*Based on PSNS monument R-30 el. 17.60'

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NAVAL FACILITIES ENGINEERING COMMAND NORTHWEST
POULSBORO, WASHINGTON

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
REMEDIAL ACTION REPORT
SEGMENT 1 - EXTENT OF ARMOR

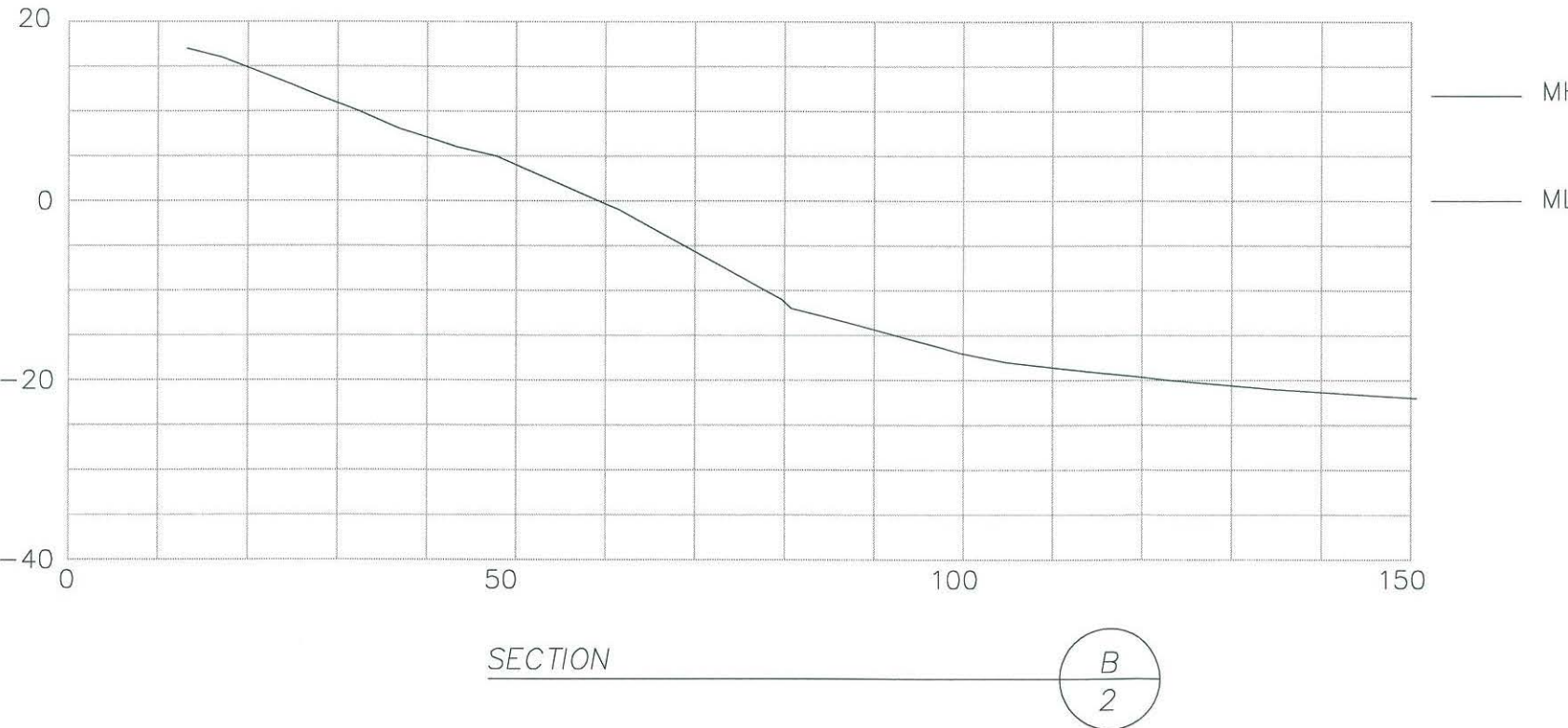
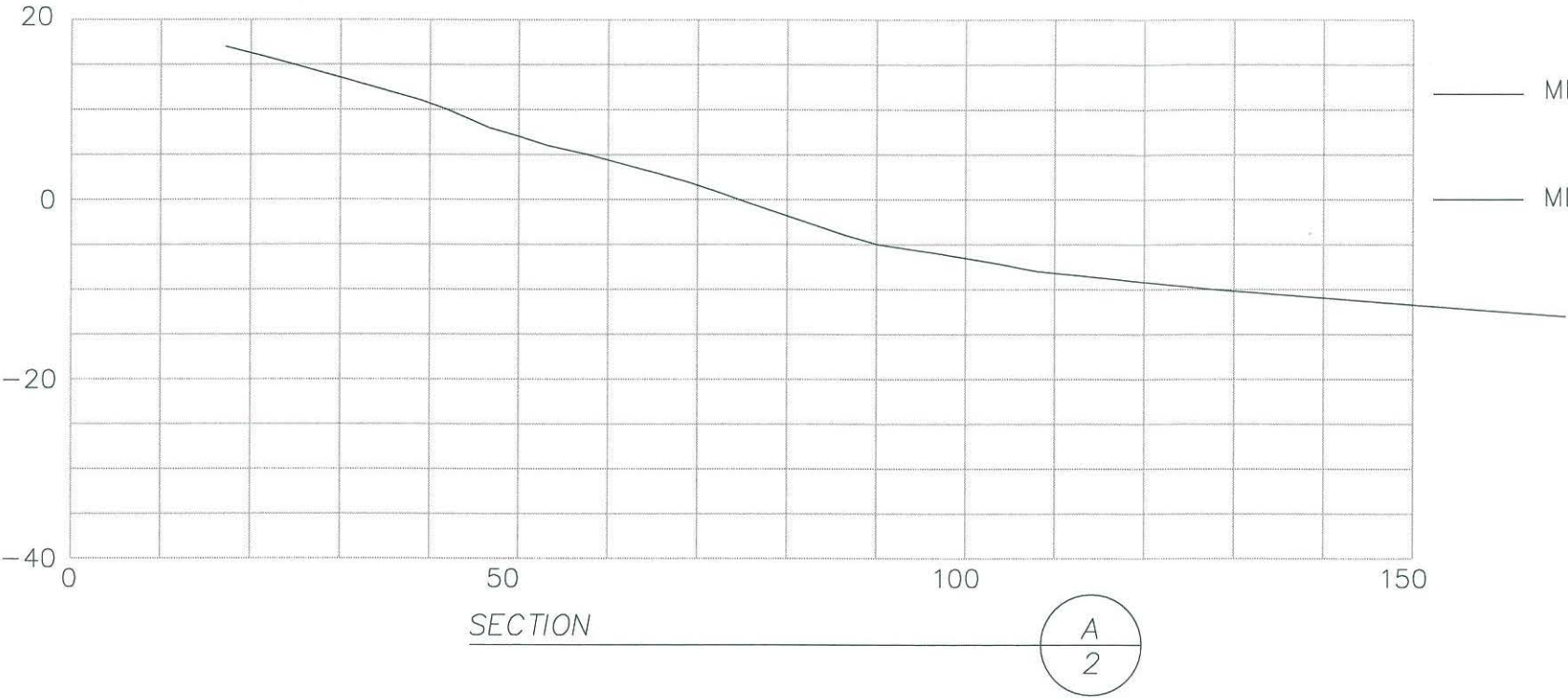
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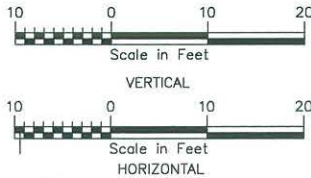
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NOTES:
1. New armor consists of min. 2.5 ft. thick layer of large armor rock (surface voids filled with rat rock).

RECORD
DRAWING

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HALFSIZE



DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *

*Based on PSNS monument R-30 el. 17.60'

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POULSBORO, WASHINGTON

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
TITLE SHEET, DRAWING LIST &
VICINITY MAP

Tt TETRA TECH EC, INC.

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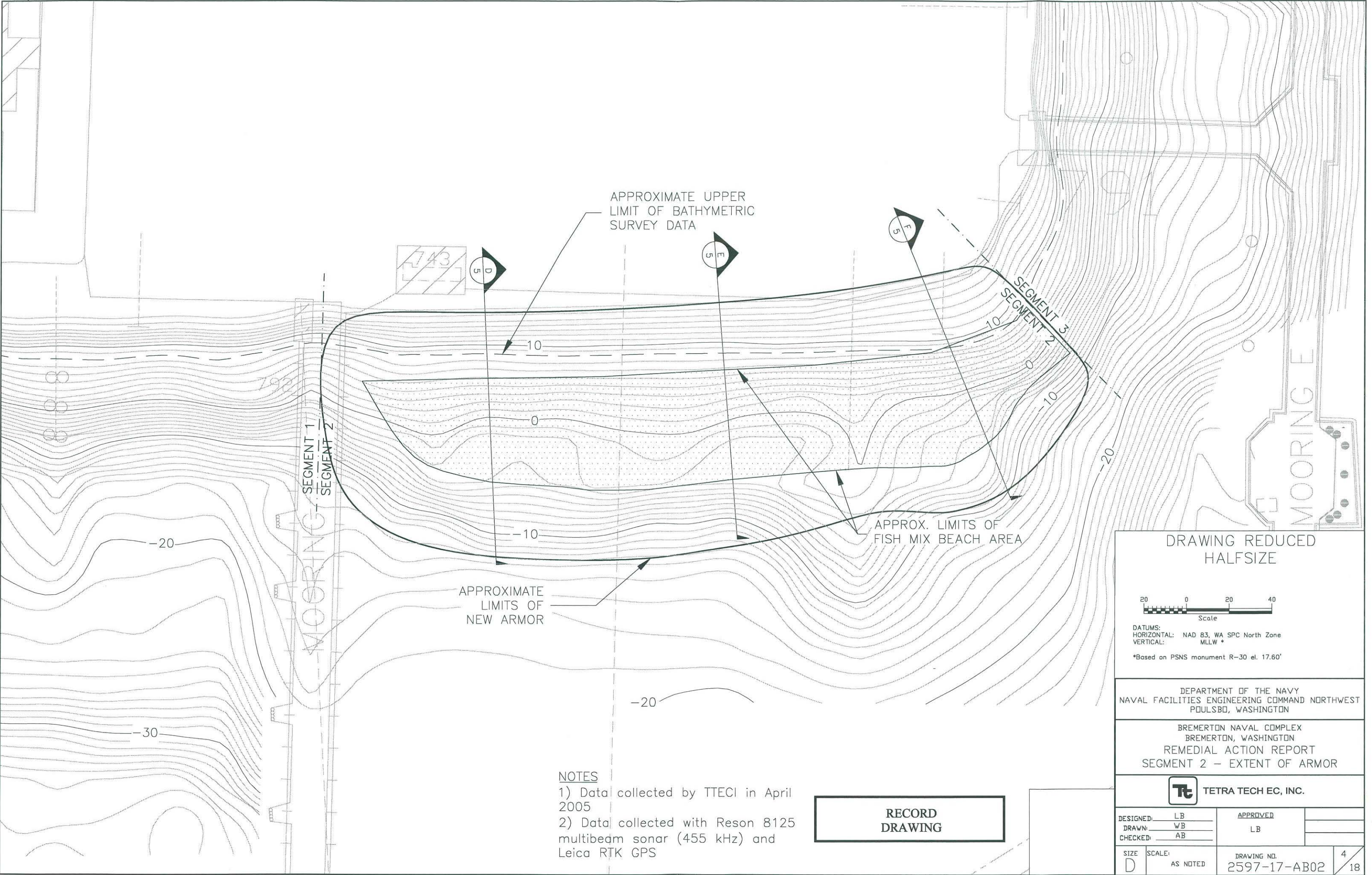
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2597-17-AB01

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NOTES
1) Data collected by TTECI in April 2005
2) Data collected with Reson 8125 multibeam sonar (455 kHz) and Leica RTK GPS

RECORD
DRAWING

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Scale

DATUMS:
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VERTICAL: MLLW *

*Based on PSNS monument R-30 el. 17.60'

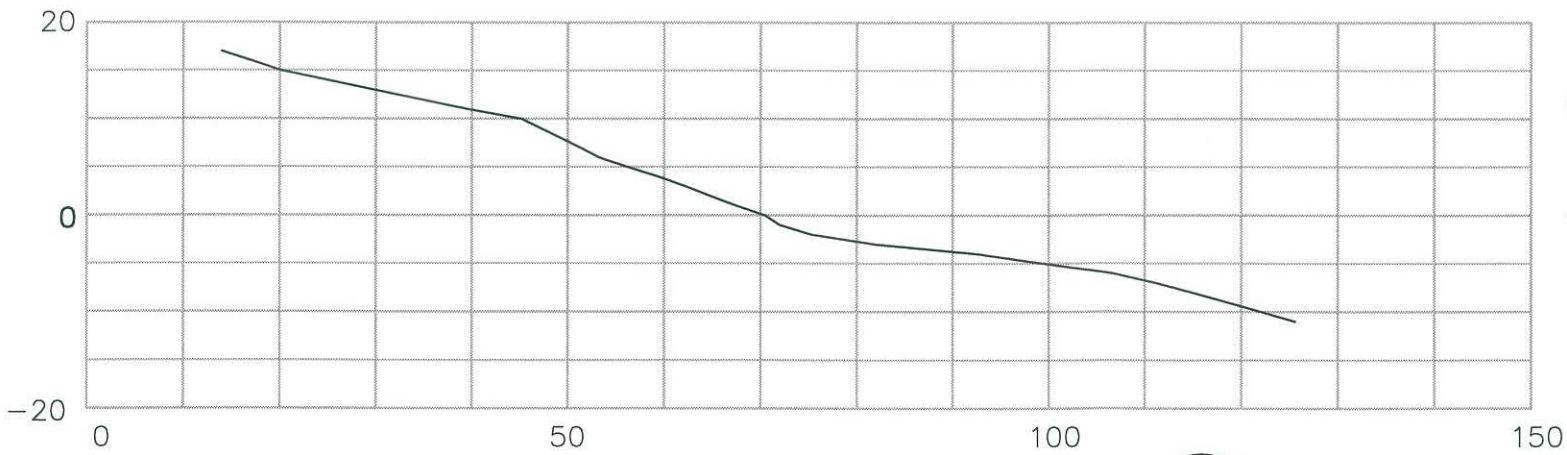
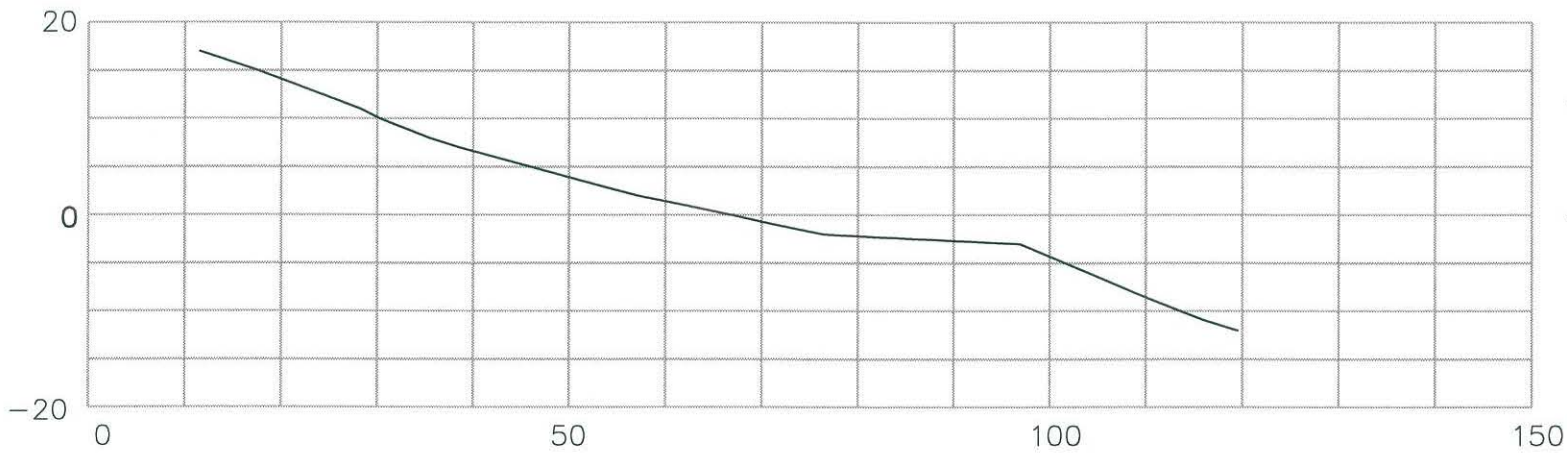
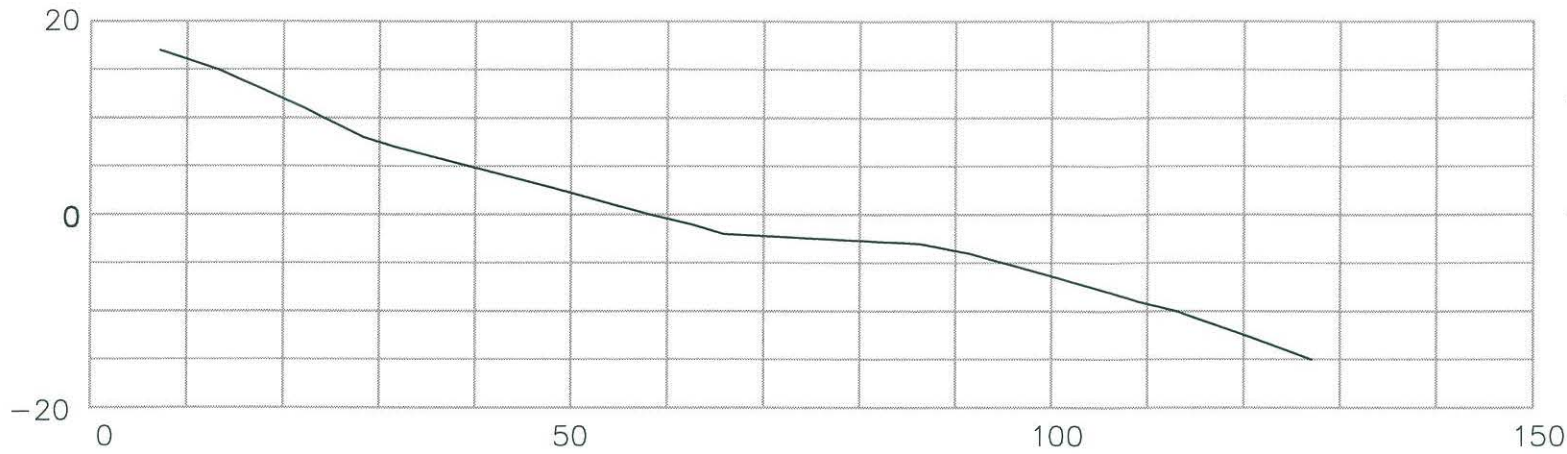
DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND NORTHWEST
POULSBORO, WASHINGTON

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
REMEDIAL ACTION REPORT
SEGMENT 2 - EXTENT OF ARMOR

Tt TETRA TECH EC, INC.

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DRAWN: WB	
CHECKED: AB	

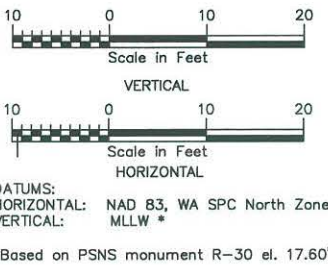
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- NOTES:
1. New armor above approx. elev. +4 MLLW consists of large armor rock (surface voids filled with rat rock).
 2. New armor in beach area between approx. elev. +4 and -4 consists of min. 5 ft. thick layer of Type 1 fish mix.
 3. New toe berm armor at base of beach area constructed of small armor rock (surface voids filled with Type 2 fish mix).

RECORD
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HALFSIZE

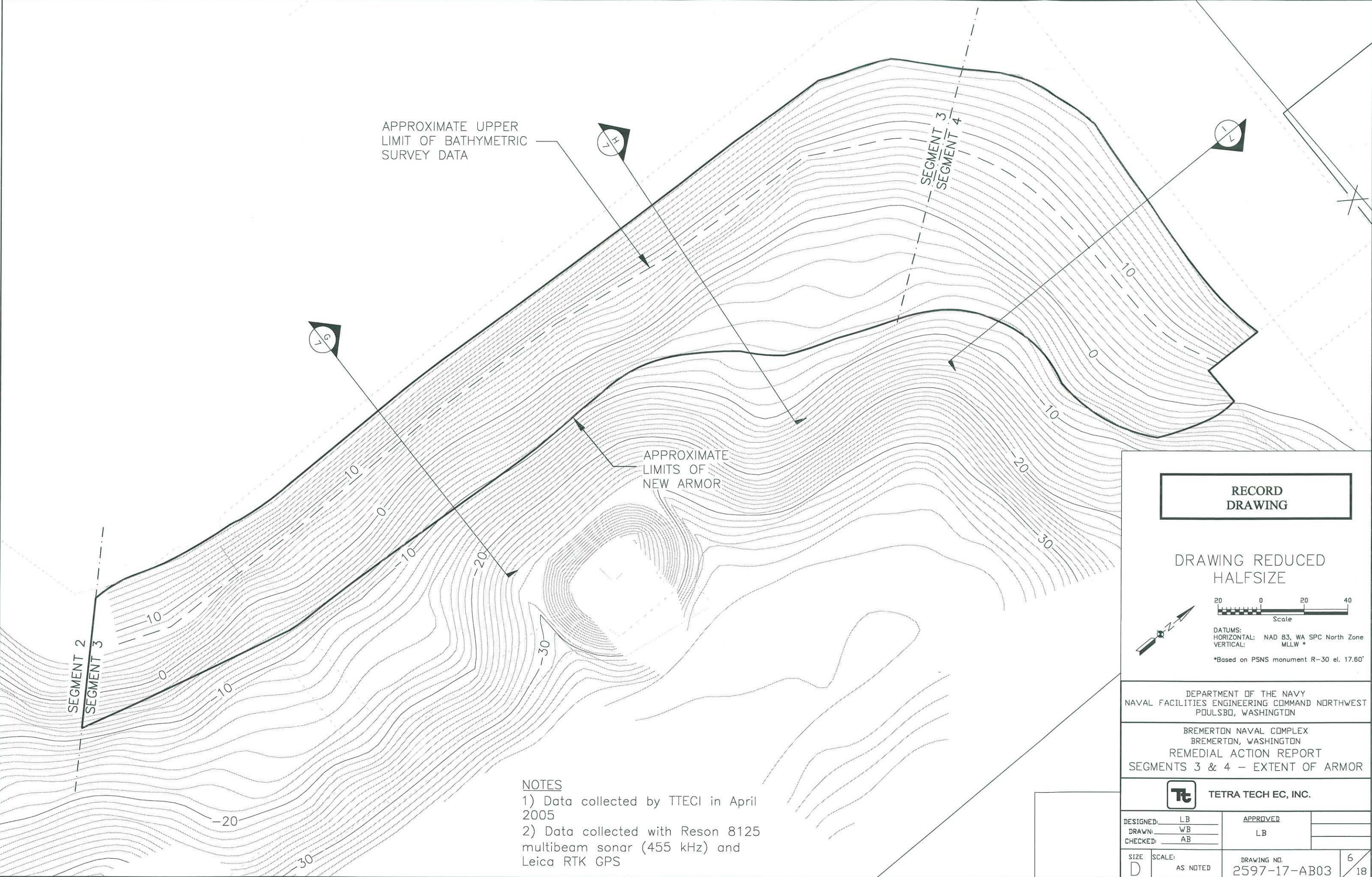


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NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY, NORTHWEST
POULSBORO, WASHINGTON

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
REMEDIAL ACTION REPORT
SEGMENT 2 - SECTIONS

Tt TETRA TECH EC, INC.

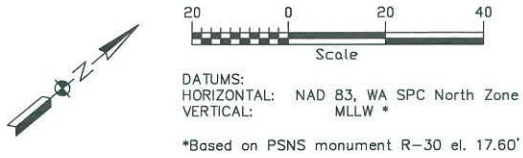
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- NOTES
- 1) Data collected by TTECI in April 2005
 - 2) Data collected with Reson 8125 multibeam sonar (455 kHz) and Leica RTK GPS

RECORD
DRAWING

DRAWING REDUCED
HALFSIZE



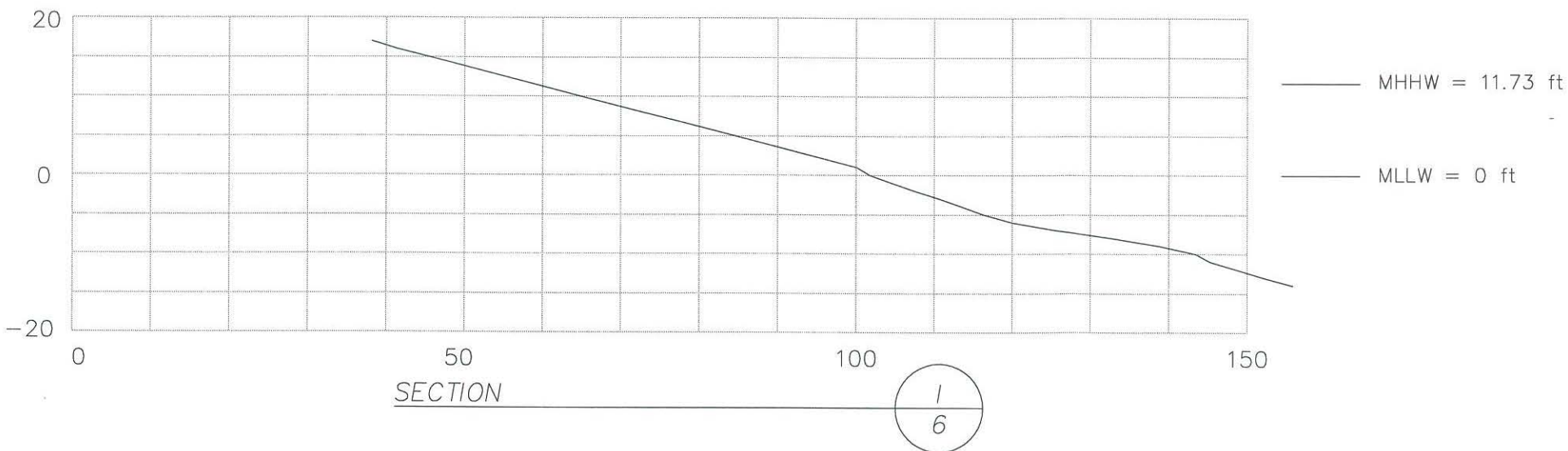
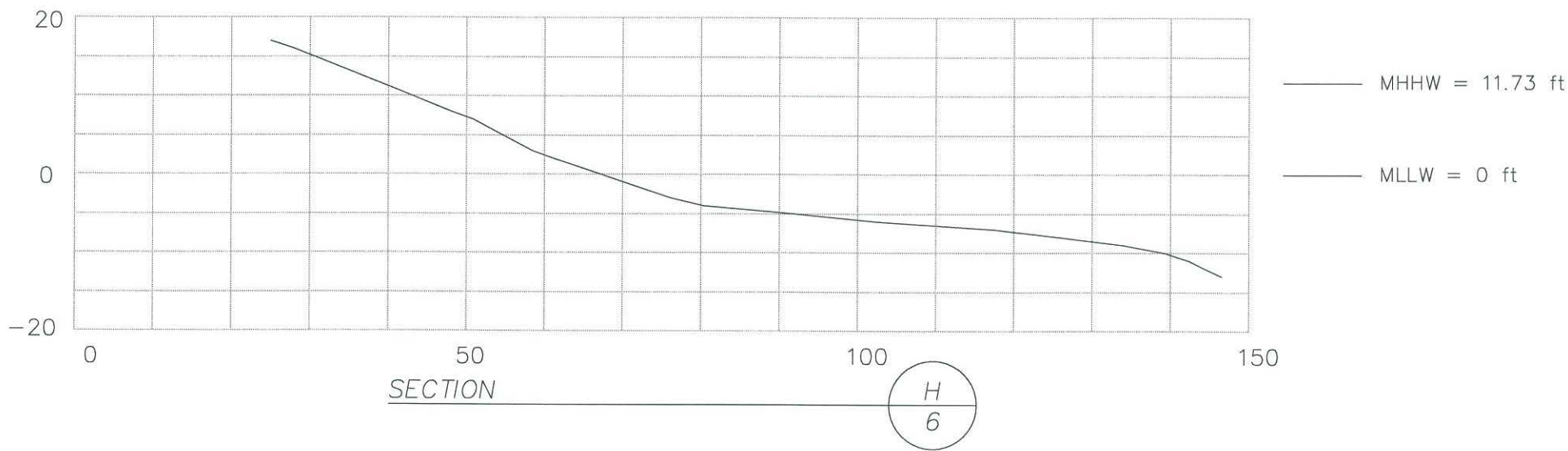
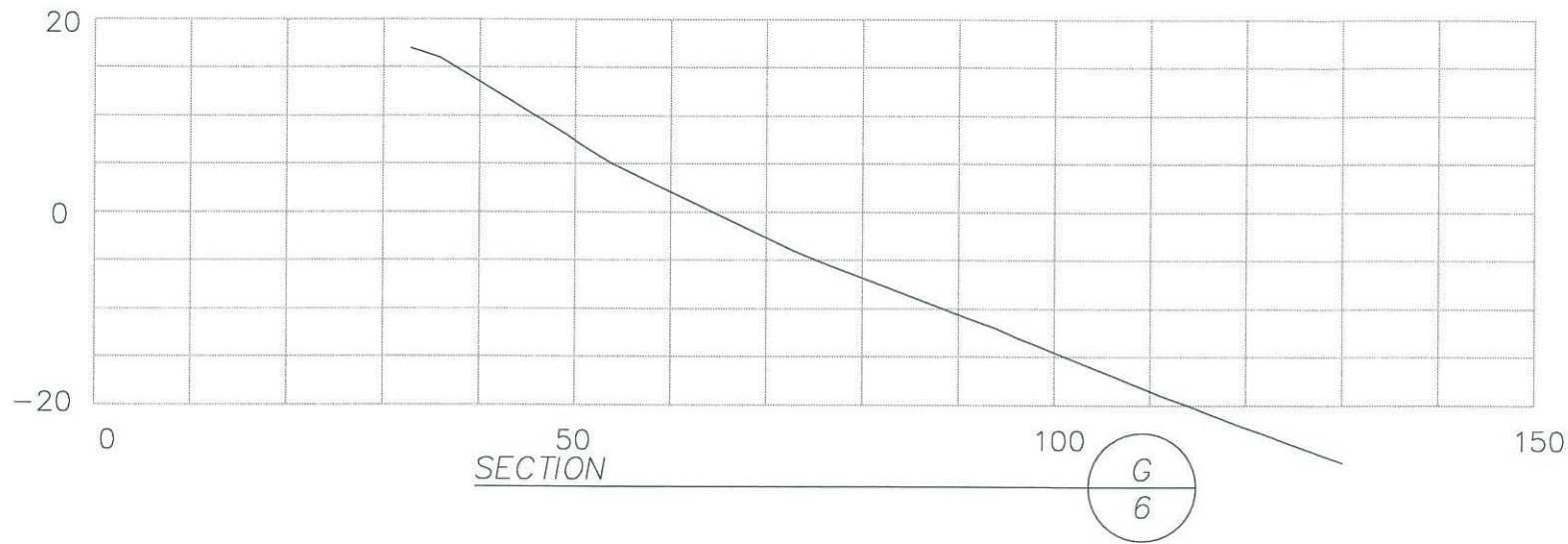
DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND NORTHWEST
POULSBORO, WASHINGTON

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
REMEDIAL ACTION REPORT
SEGMENTS 3 & 4 - EXTENT OF ARMOR

 TETRA TECH EC, INC.

DESIGNED: LB	APPROVED	
DRAWN: WB	LB	
CHECKED: AB		
SIZE D	SCALE: AS NOTED	DRAWING NO. 2597-17-AB03
		6 18

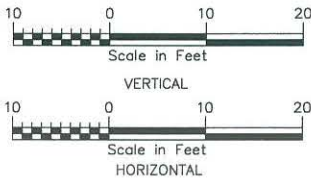
\\Poulsbo\Projects\TD 17\Deliverables\Remedial Action Report\Internal Draft (All Segments)\Drawings\2597-17-AB03.dwg



- NOTES:
1. New armor in Segment 3 consists of min. 1.5 ft. thick layer of small armor rock (surface voids filled with Type 2 fish mix).
 2. New armor in Segment 4 consists of min. 2 ft. thick layer of Type 2 fish mix.

RECORD
DRAWING

DRAWING REDUCED
HALFSIZE



DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *
*Based on PSNS monument R-30 el. 17.60'

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NAVAL FACILITIES ENGINEERING COMMAND NORTHWEST
POULSBORO, WASHINGTON

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
REMEDIAL ACTION REPORT
SEGMENTS 3 AND 4 SECTIONS



TETRA TECH EC, INC.

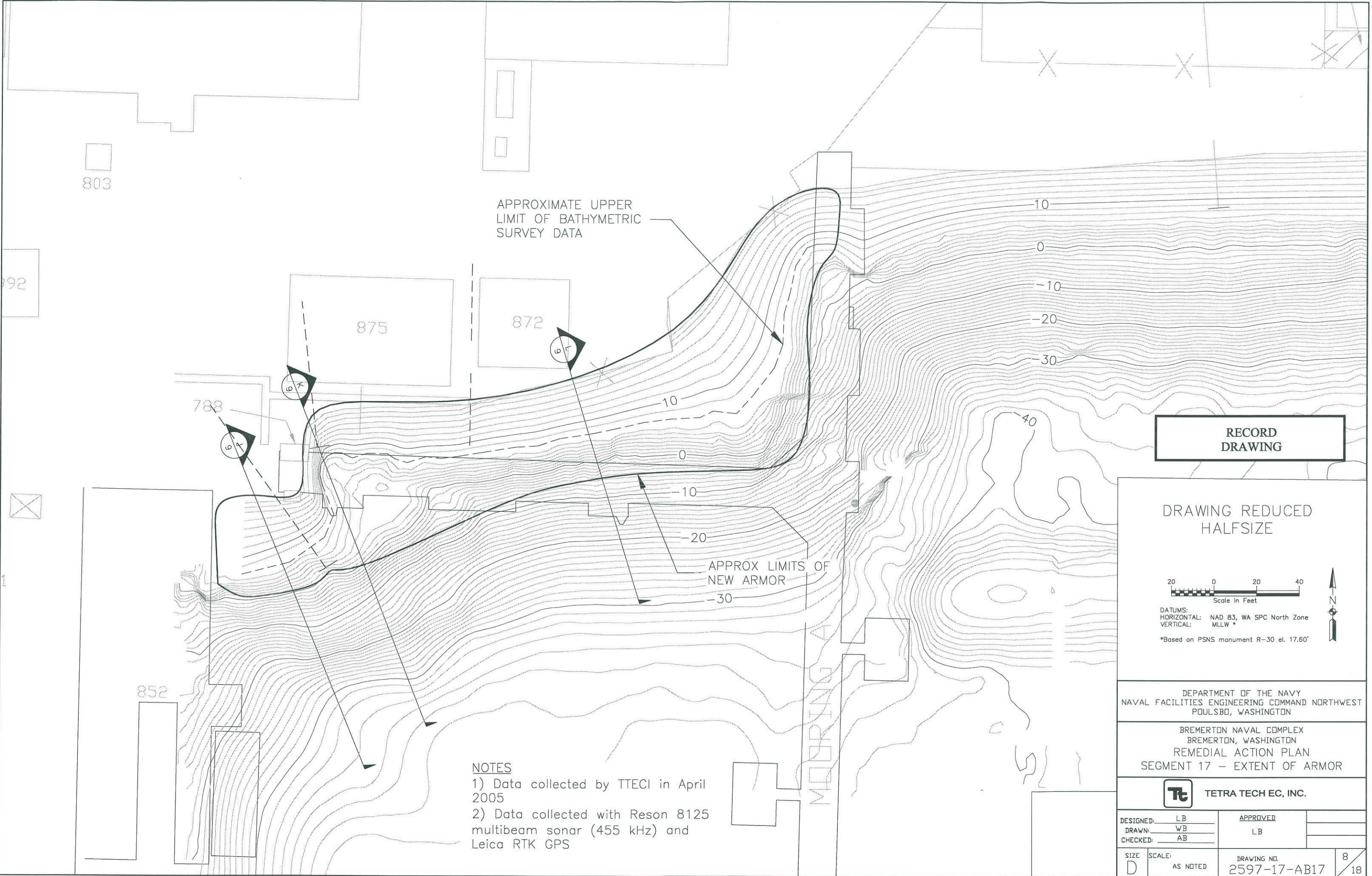
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DRAWN: WB
CHECKED: AB

APPROVED
LB

SIZE: D
SCALE: AS NOTED

DRAWING NO.
2597-17-AB03

7
18



NOTES
1) Data collected by TTECI in April 2005
2) Data collected with Reson 8125 multibeam sonar (455 kHz) and Leica RTK GPS

RECORD
DRAWING

DRAWING REDUCED
HALFSIZE

20 0 20 40
Scale in Feet
DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *
*Based on PSNS monument R-30 el. 17.60'

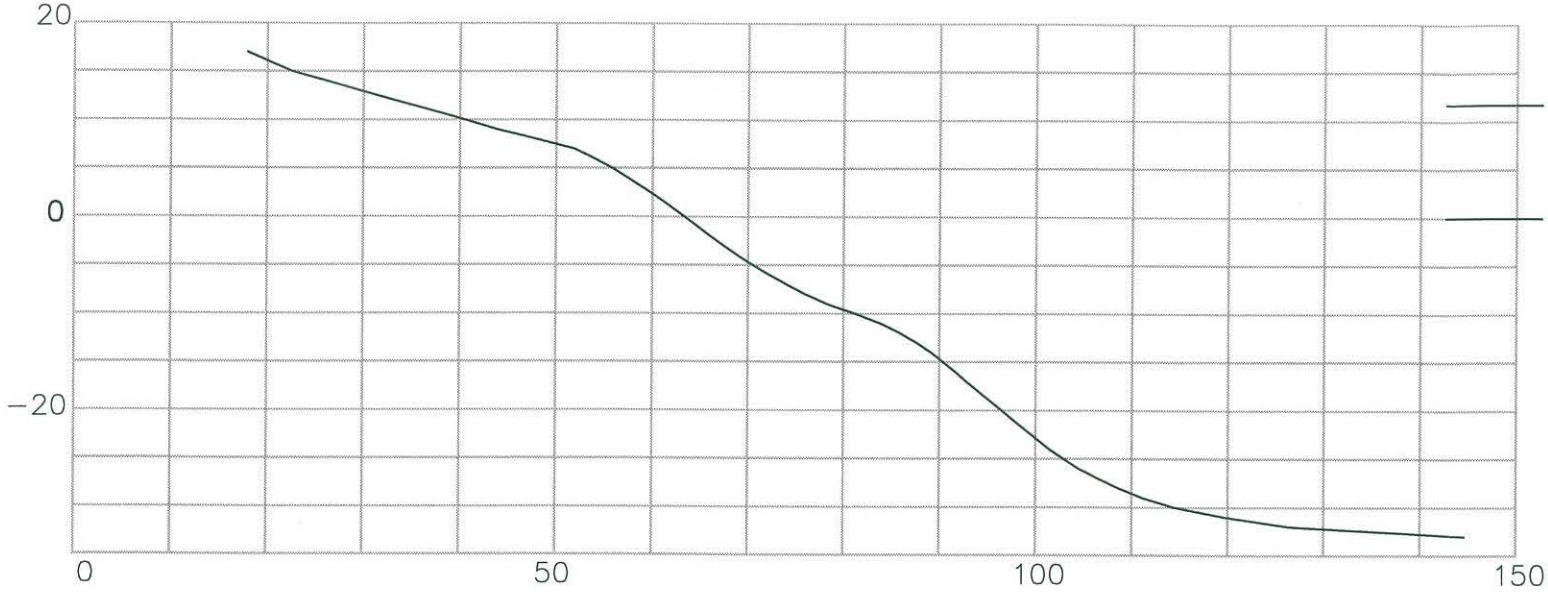
DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND NORTHWEST
POULSBORO, WASHINGTON

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
REMEDIAL ACTION PLAN
SEGMENT 17 - EXTENT OF ARMOR

Tt TETRA TECH EC, INC.

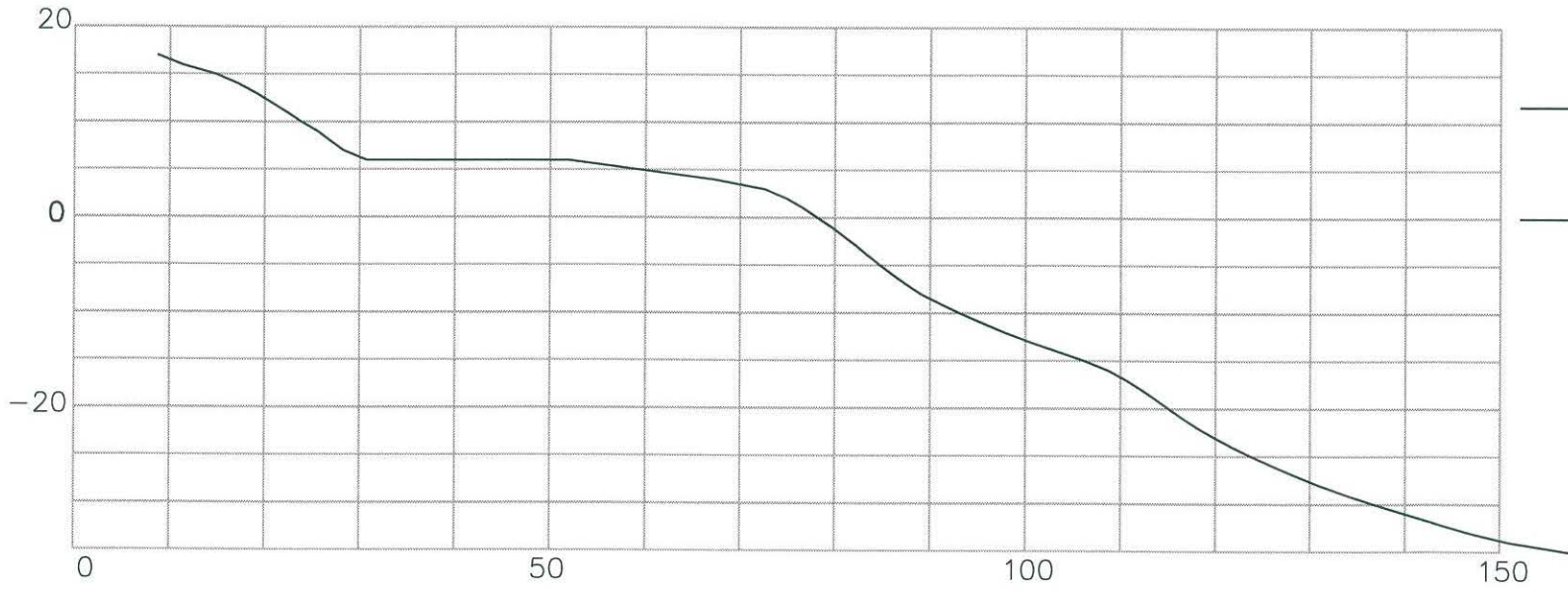
DESIGNED: LB
DRAWN: WB
CHECKED: AB
APPROVED: LB

SIZE: D SCALE: AS NOTED
DRAWING NO. 2597-17-AB17
8/18



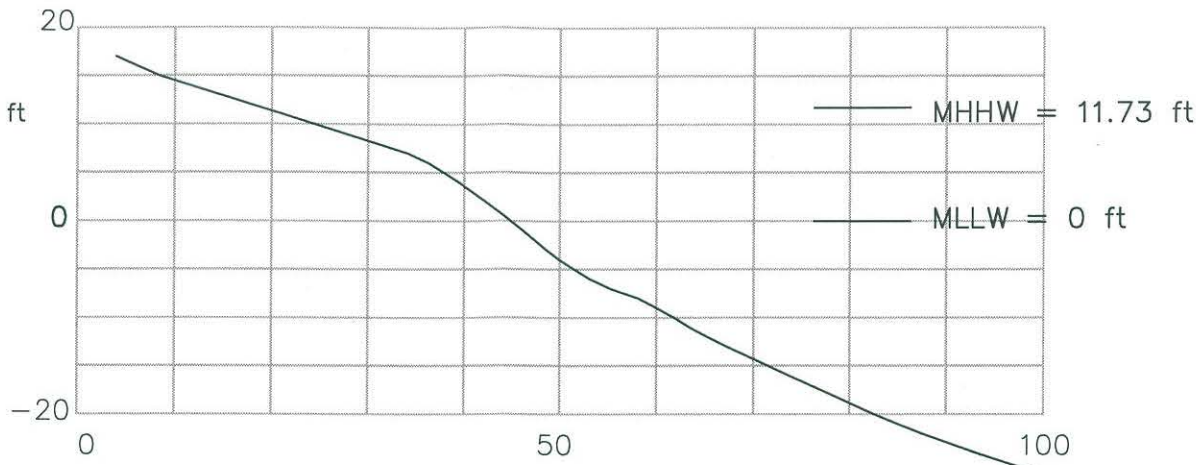
SECTION

J
8



SECTION

K
8

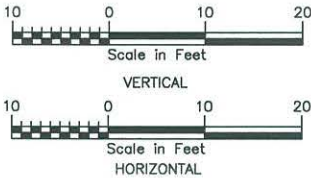


SECTION

L
8

NOTES:
1. New armor consists of min. 1.5 ft. thick layer of small armor rock (surface voids filled with Type 2 fish mix).

DRAWING REDUCED
HALFSIZE



DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *

*Based on PSNS monument R-30 el. 17.60'

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POULSBORO, WASHINGTON

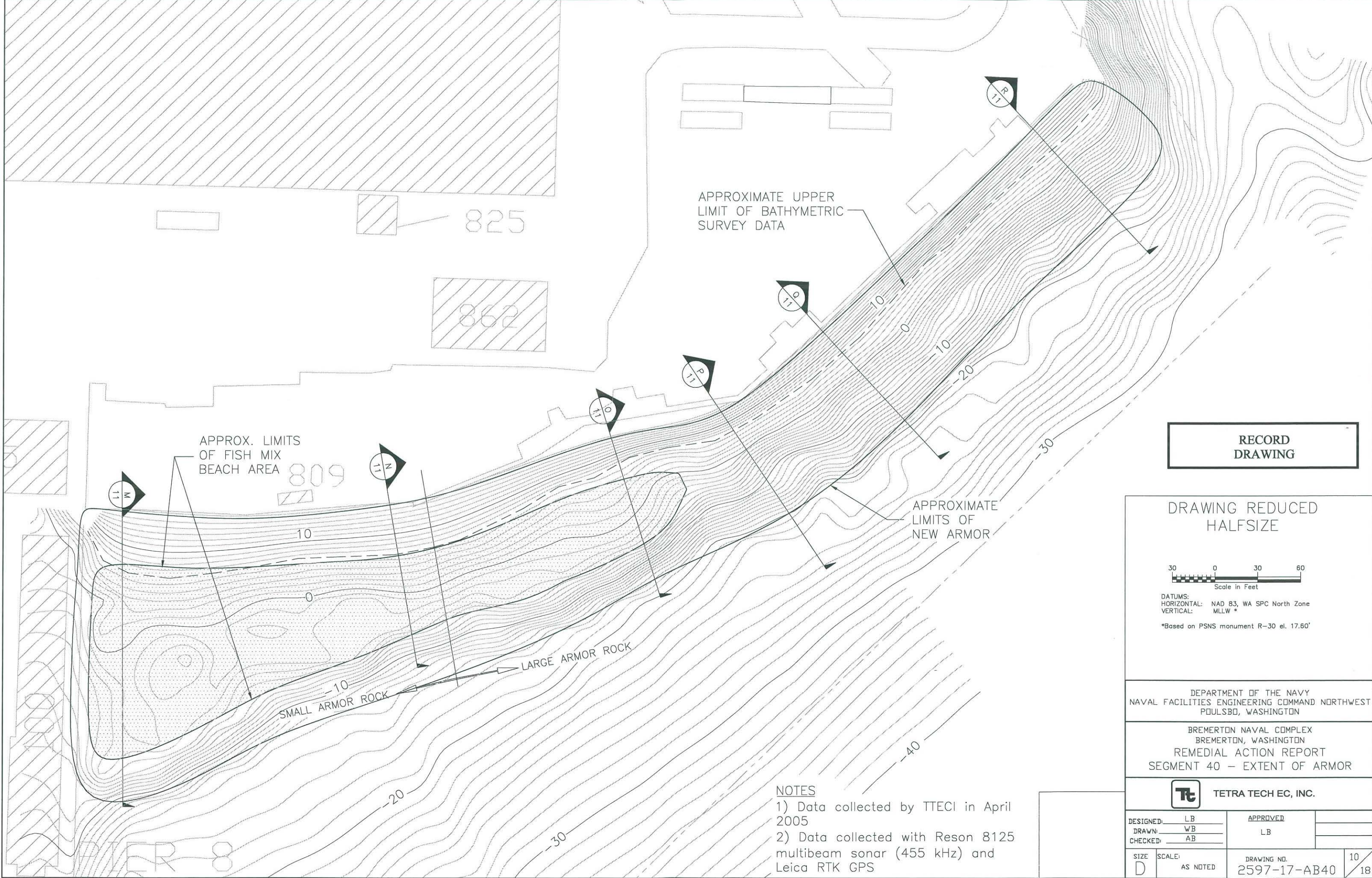
BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
REMEDIAL ACTION REPORT
SEGMENT 17 - SECTIONS

TETRA TECH EC, INC.

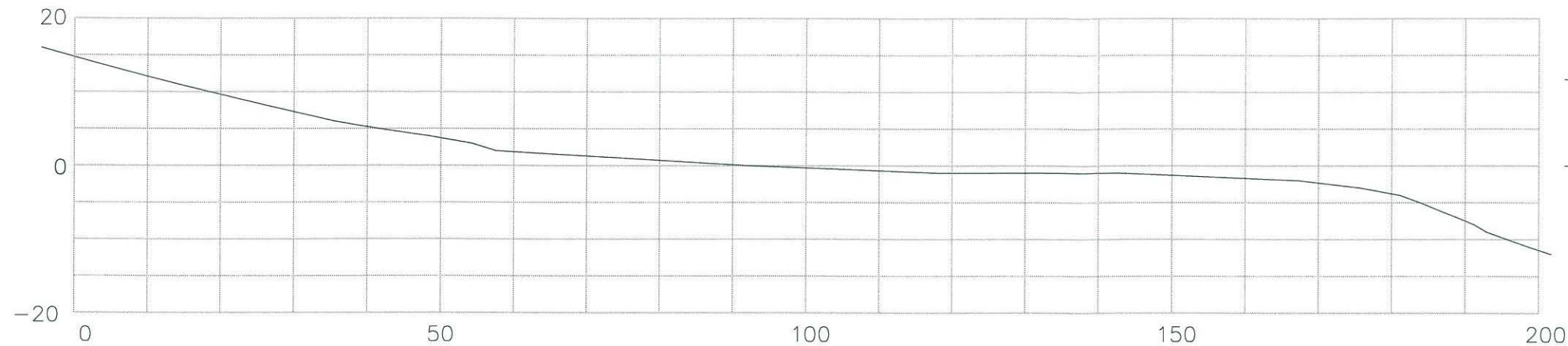
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DRAWN: WB
CHECKED: AB
APPROVED: LB

SIZE: D
SCALE: AS NOTED
DRAWING NO. 2597-17-AB17
9/18

RECORD
DRAWING

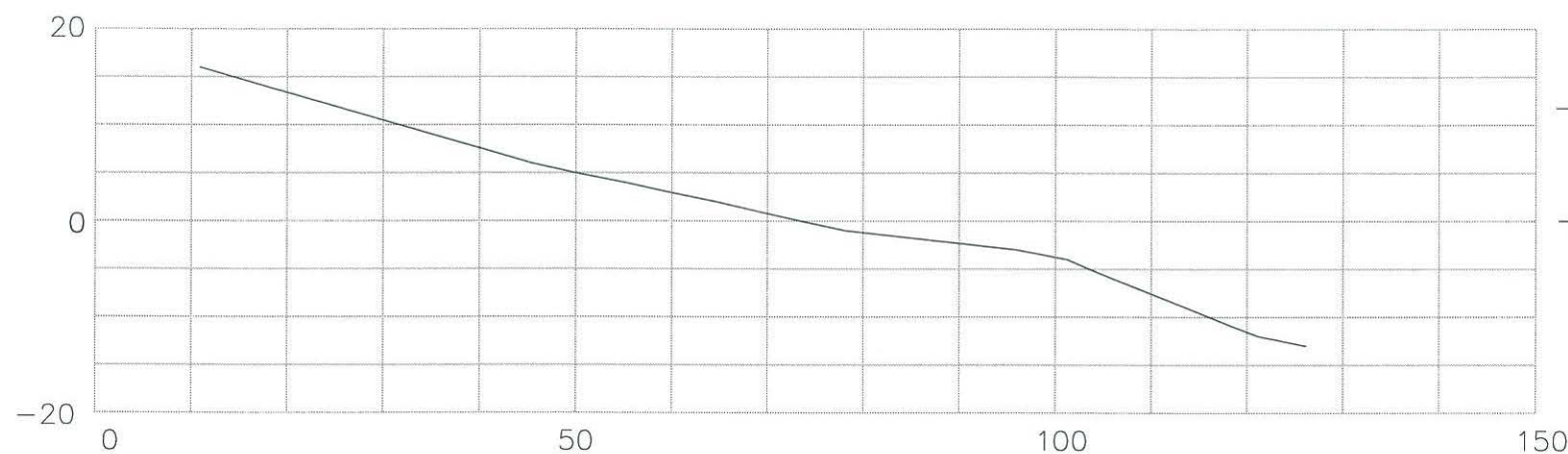


\\Poulsbo\Projects\TD 17\Deliverables\Remedial Action Report\Internal Draft (All Segments)\Drawings\2597-17-AB40.dwg



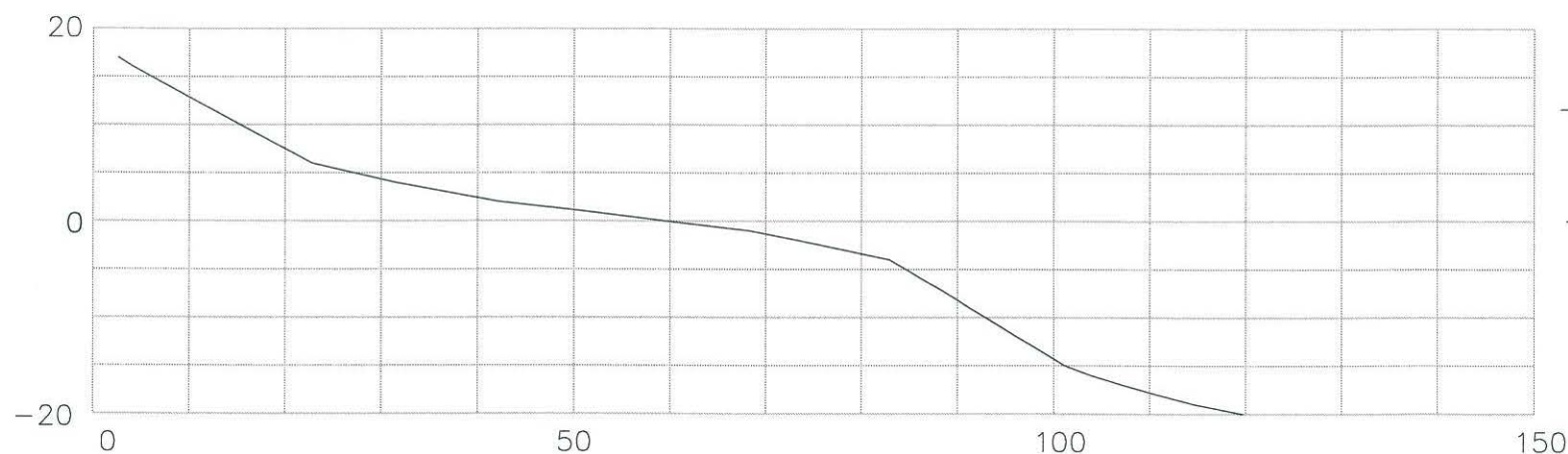
SECTION

M
10



SECTION

N
10



SECTION

O
10

MHHW = 11.73 ft

MLLW = 0 ft

NOTES:

1. New armor in westerly 250 feet of Segment 40 above approx. elev. +4 MLLW consists of min. 1.5 ft. thick layer of small armor rock (surface voids filled with Type 2 fish mix).
2. New armor in remaining easterly portion of Segment 40 consists of min. 2.5 ft. thick layer of large armor rock (surface voids filled with rat rock).
3. New armor in beach area between approx. elev. +4 and -4 MLLW in westerly 400 ft. of Segment 40 consists of min. 5 ft. thick layer of Type 2 fish mix.
4. New toe berm armor at base of beach area constructed of small armor rock (surface voids filled with Type 2 fish mix) in westerly 250 ft. and large armor rock (surface voids filled with rat rock) in easterly 150 ft.

DRAWING REDUCED
HALFSIZE



Scale in Feet

VERTICAL



Scale in Feet

HORIZONTAL

DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *

*Based on PSNS monument R-30 el. 17.60'

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NAVAL FACILITIES ENGINEERING COMMAND NORTHWEST
POULSBORO, WASHINGTON

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
REMEDIAL ACTION REPORT
SEGMENT 40 - SECTIONS



TETRA TECH EC, INC.

DESIGNED: LB
DRAWN: WB
CHECKED: AB

APPROVED
LB

SIZE
D

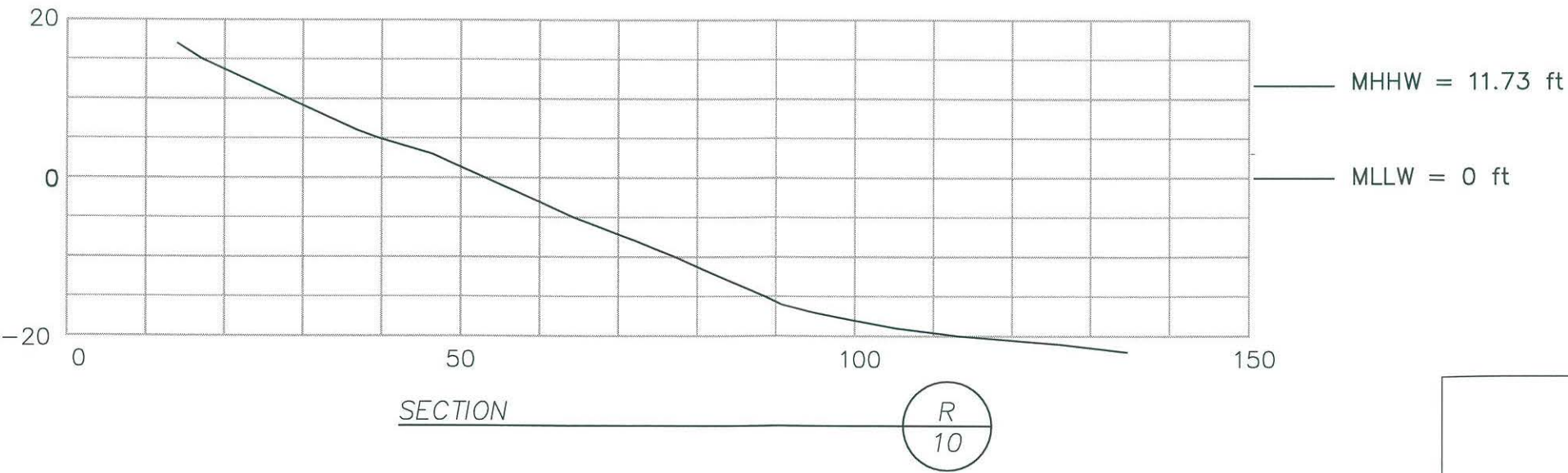
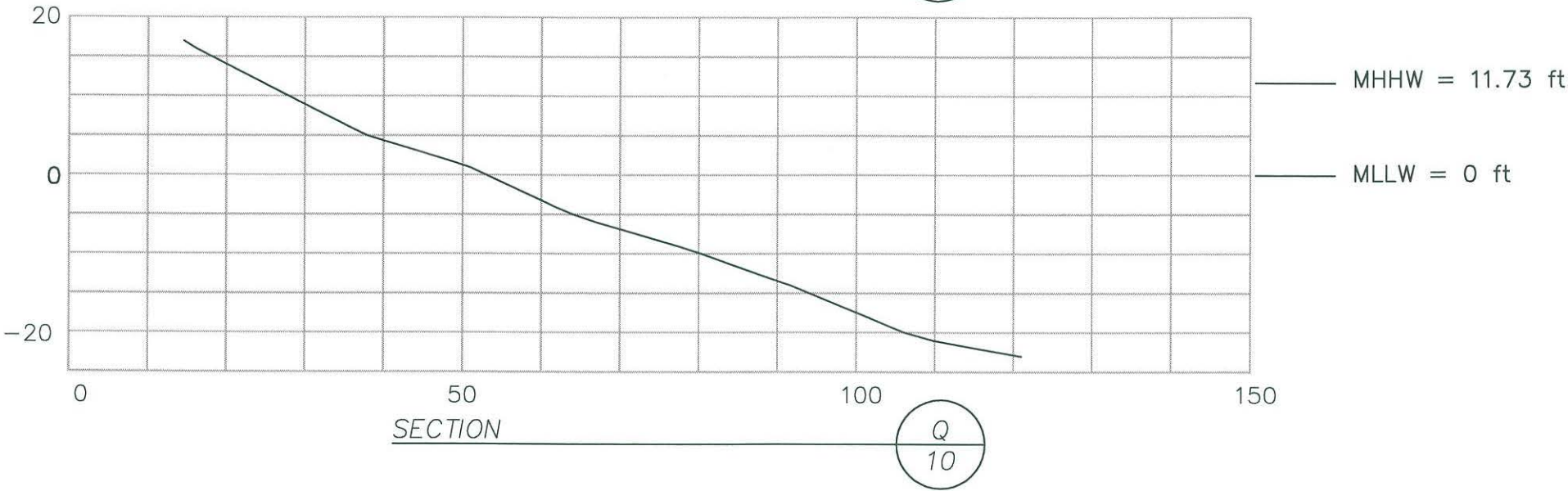
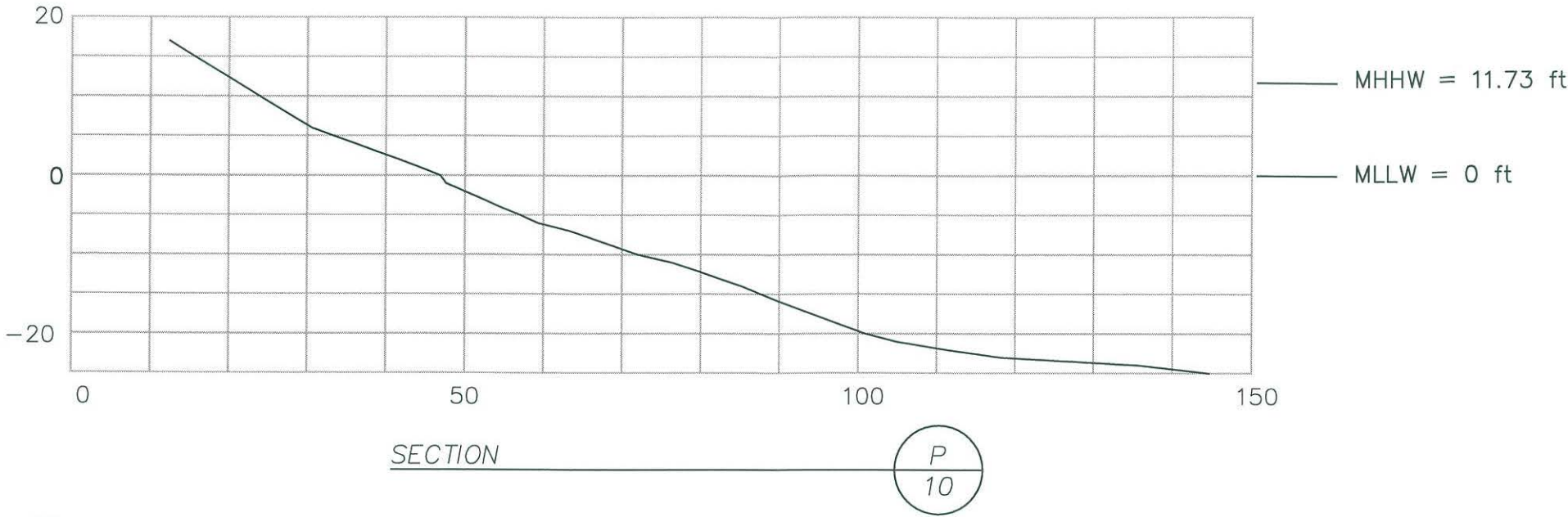
SCALE:
AS NOTED

DRAWING NO.
2597-17-AB40

11
18

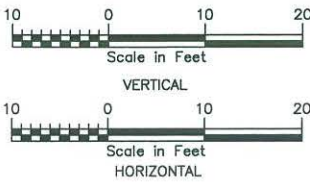
RECORD
DRAWING

NOTES:
See Sheet 11 for notes



RECORD
DRAWING

DRAWING REDUCED
HALFSIZE



DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *

*Based on PSNS monument R-30 el. 17.60'

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND NORTHWEST
POULSBORO, WASHINGTON

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
REMEDIAL ACTION REPORT
SEGMENT 40 - SECTIONS



TETRA TECH EC, INC.

DESIGNED: LB
DRAWN: WB
CHECKED: AB

APPROVED
LB

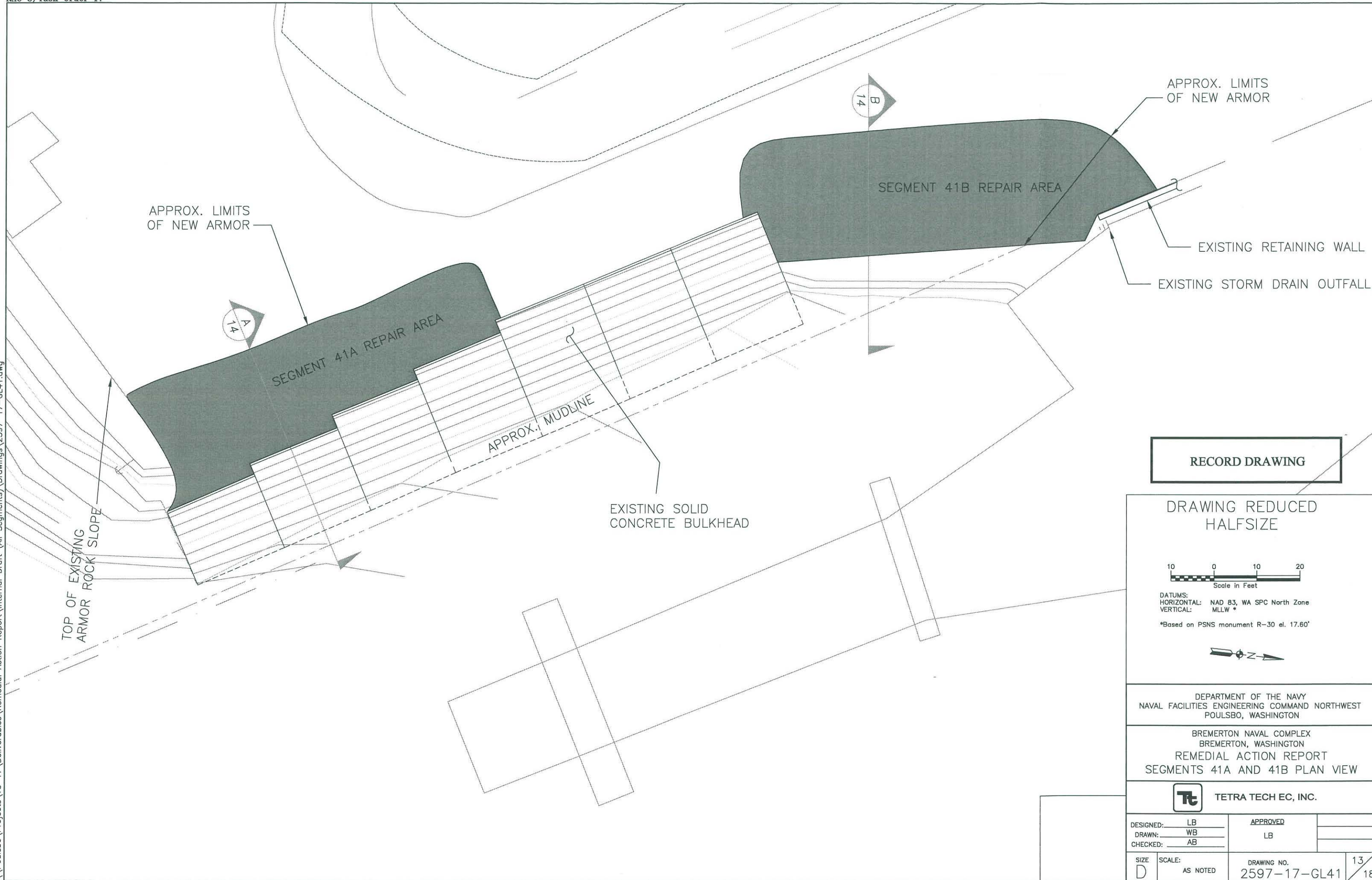
SIZE
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SCALE:
AS NOTED

DRAWING NO.
2597-17-AB40

12
18

\\Poulsbo\Projects\TD 17\Deliverables\Remedial Action Report\Internal Draft (All Segments)\Drawings\2597-17-GL41.dwg



RECORD DRAWING

DRAWING REDUCED
HALFSIZE



DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *

*Based on PSNS monument R-30 el. 17.60'



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NAVAL FACILITIES ENGINEERING COMMAND NORTHWEST
POULSBORO, WASHINGTON

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
REMEDIAL ACTION REPORT
SEGMENTS 41A AND 41B PLAN VIEW



TETRA TECH EC, INC.

DESIGNED: LB
DRAWN: WB
CHECKED: AB

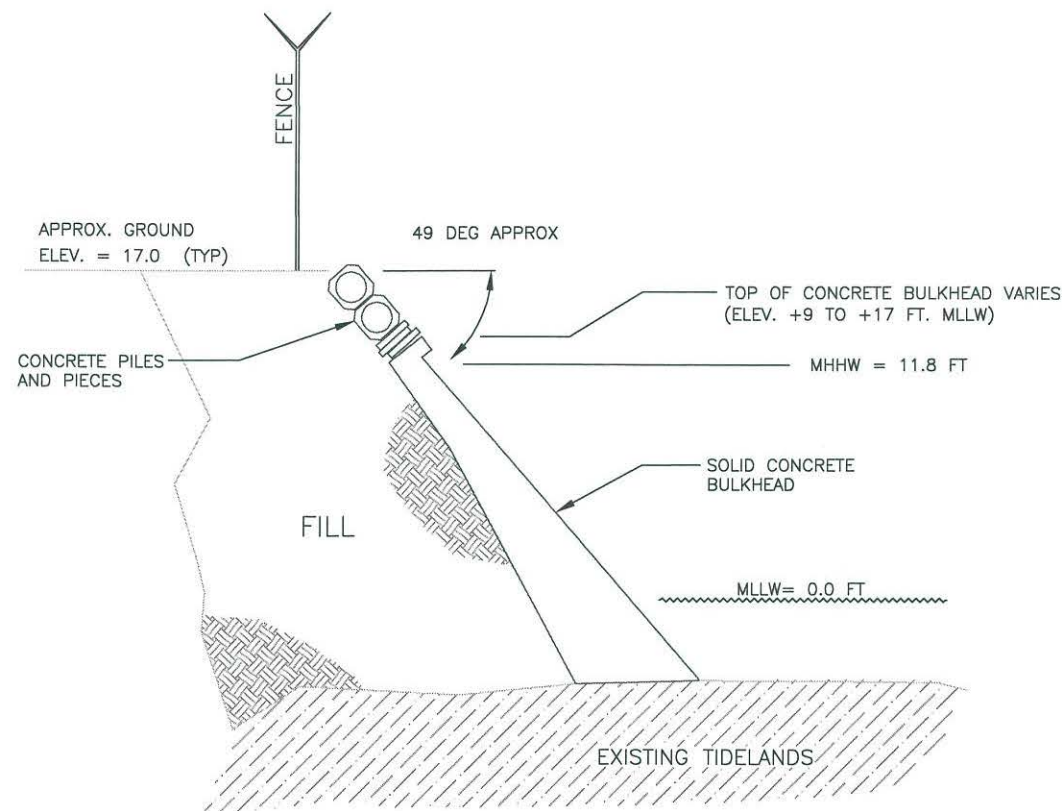
APPROVED
LB

SIZE
D

SCALE:
AS NOTED

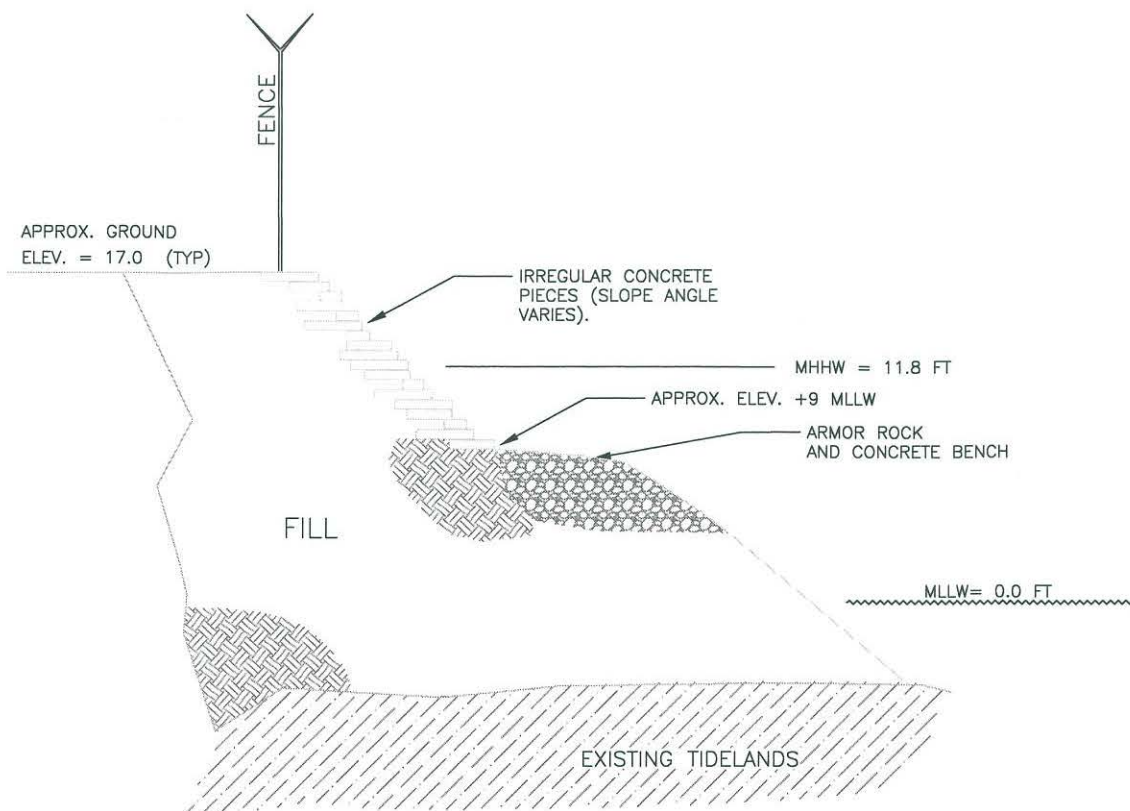
DRAWING NO.
2597-17-GL41

13
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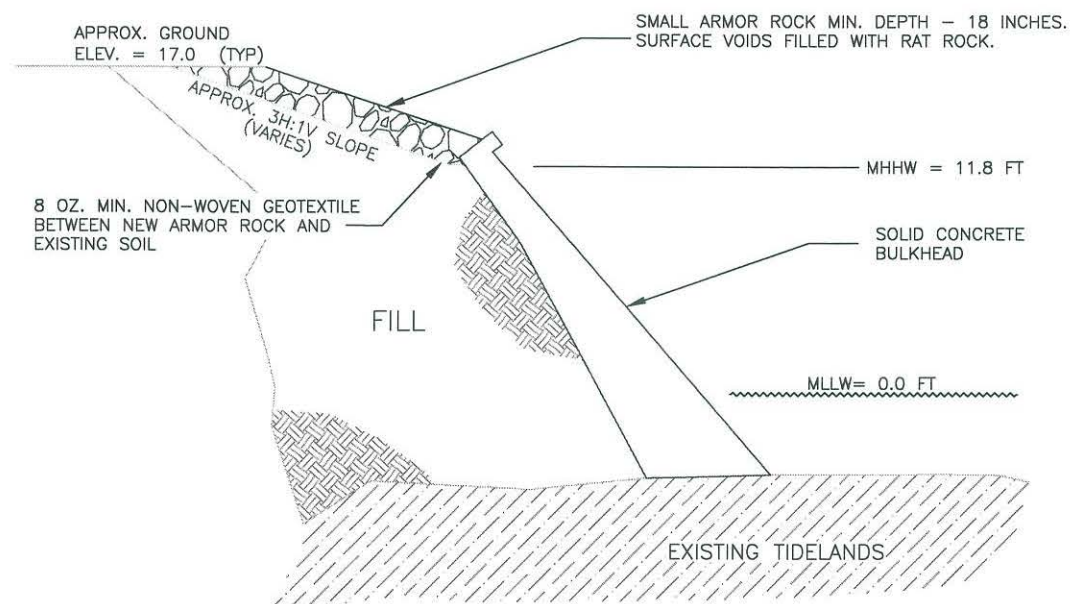
SECTION (BEFORE REPAIR)

A
13



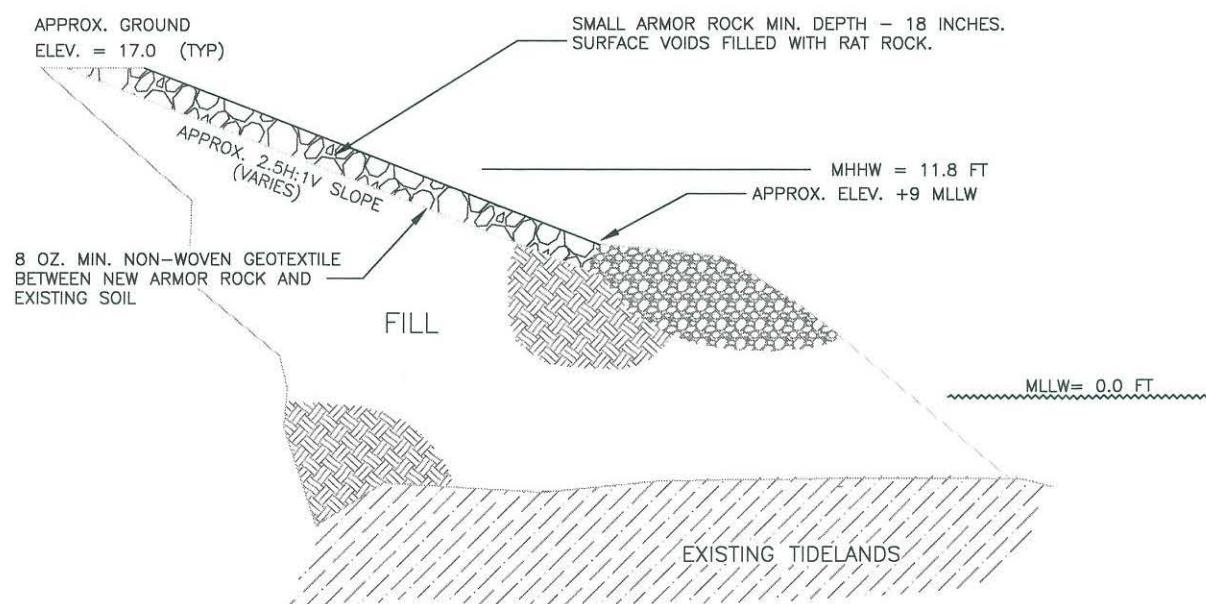
SECTION (BEFORE REPAIR)

B
13



SECTION (AFTER REPAIR)

A
13



SECTION (AFTER REPAIR)

B
13

RECORD DRAWING

DRAWING REDUCED
HALFSIZE



DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *
*Based on PSNS monument R-30 el. 17.60'

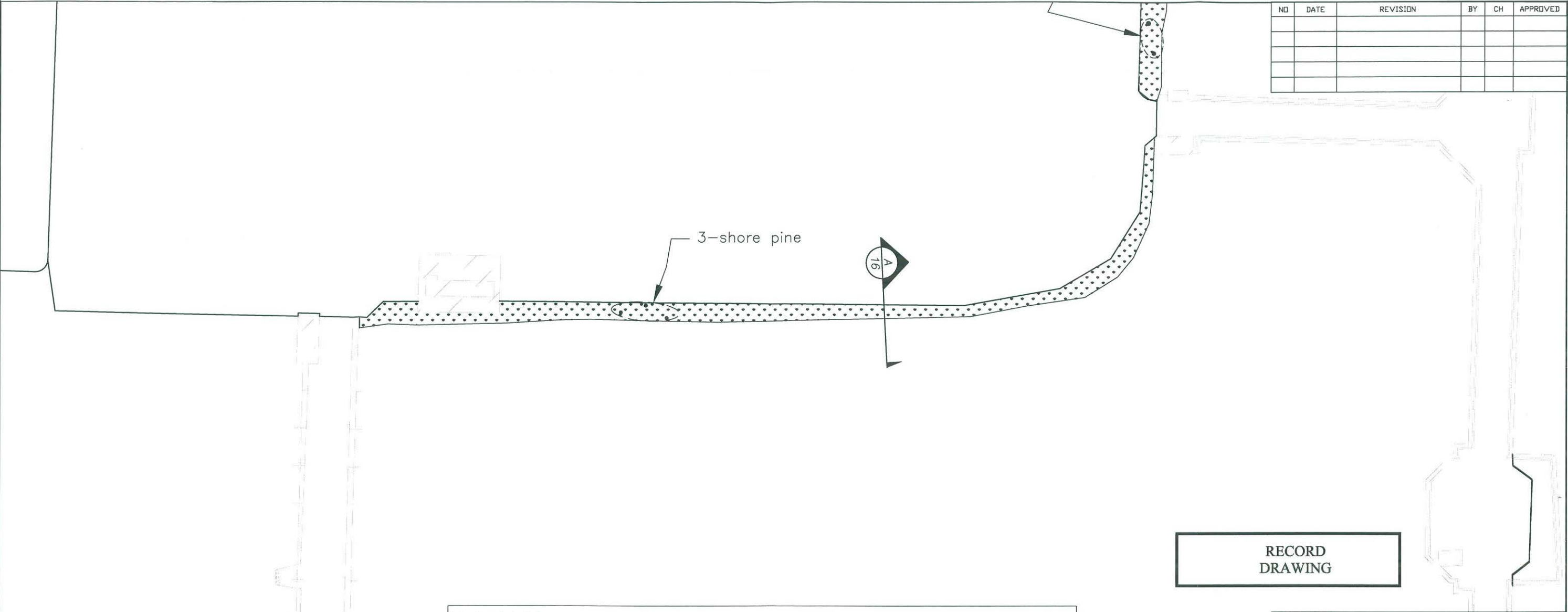
DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND NORTHWEST
POULSBO, WASHINGTON

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
REMEDIAL ACTION REPORT
SEGMENTS 41A AND 41B SECTIONS

TETRA TECH EC, INC.

DESIGNED: LB	APPROVED: LB	
DRAWN: WB		
CHECKED: AB		
SIZE: D	SCALE: AS NOTED	DRAWING NO. 2597-17-GL41
		14 18

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Planting Schedule						
species	habit	plant size	number of plants			Total
			Segment 2 (estimated area 2100 sq. ft.)	Segment 3 (estimated area 4000 sq. ft.)	Segment 4 (estimated area 2100 sq. ft.)	
Pacific dogwood (<i>Cornus nuttallii</i>)	tree	6 ft trees	-	-	4	19
shore pine (<i>Pinus contorta</i> var. <i>contorta</i>)	tree	6 ft trees	3	4	-	
bitter cherry (<i>Prunus emarginata</i>)	tree	6 ft trees	-	4	-	
Oregon white oak (<i>Quercus garryana</i>)	tree	6 ft trees	-	2	2	
red-flowering currant (<i>Ribes sanguineum</i>)	shrub	1 gal pot	28	60	28	582
thimbleberry (<i>Rubus parviflorus</i>)	shrub	1 gal pot	28	60	28	
red elderberry (<i>Sambucus racemosa</i>)	shrub	1 gal pot	15	28	15	
snowberry (<i>Symphoricarpos albus</i>)	shrub	1 gal pot	15	28	15	
evergreen huckleberry (<i>Vaccinium ovatum</i>)	shrub	1 gal pot	45	86	45	
oceanspray (<i>Holodiscus discolor</i>)	shrub	1 gal pot	15	28	15	657
kinnikinnik (<i>Arctostaphylos uva-ursi</i>)	ground-cover	1 gal pot	165	327	165	

The trees in all segments are clustered as shown on the plans. Shrub plantings are spaced approx. 3 feet apart, groundcover plantings spaced 2 feet apart. Plant species are intermixed.

RECORD
DRAWING

DRAWING REDUCED
HALFSIZE

DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *
*Based on PSNS monument R-30 el. 17.60'

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NAVAL FACILITIES ENGINEERING COMMAND NORTHWEST
POULSBORO, WASHINGTON

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
REMEDIAL ACTION PLAN
SEGMENT 2 - REVEGETATION AREA

TETRA TECH EC, INC.

DESIGNED: JG
DRAWN: JG
CHECKED: AB

APPROVED
LB

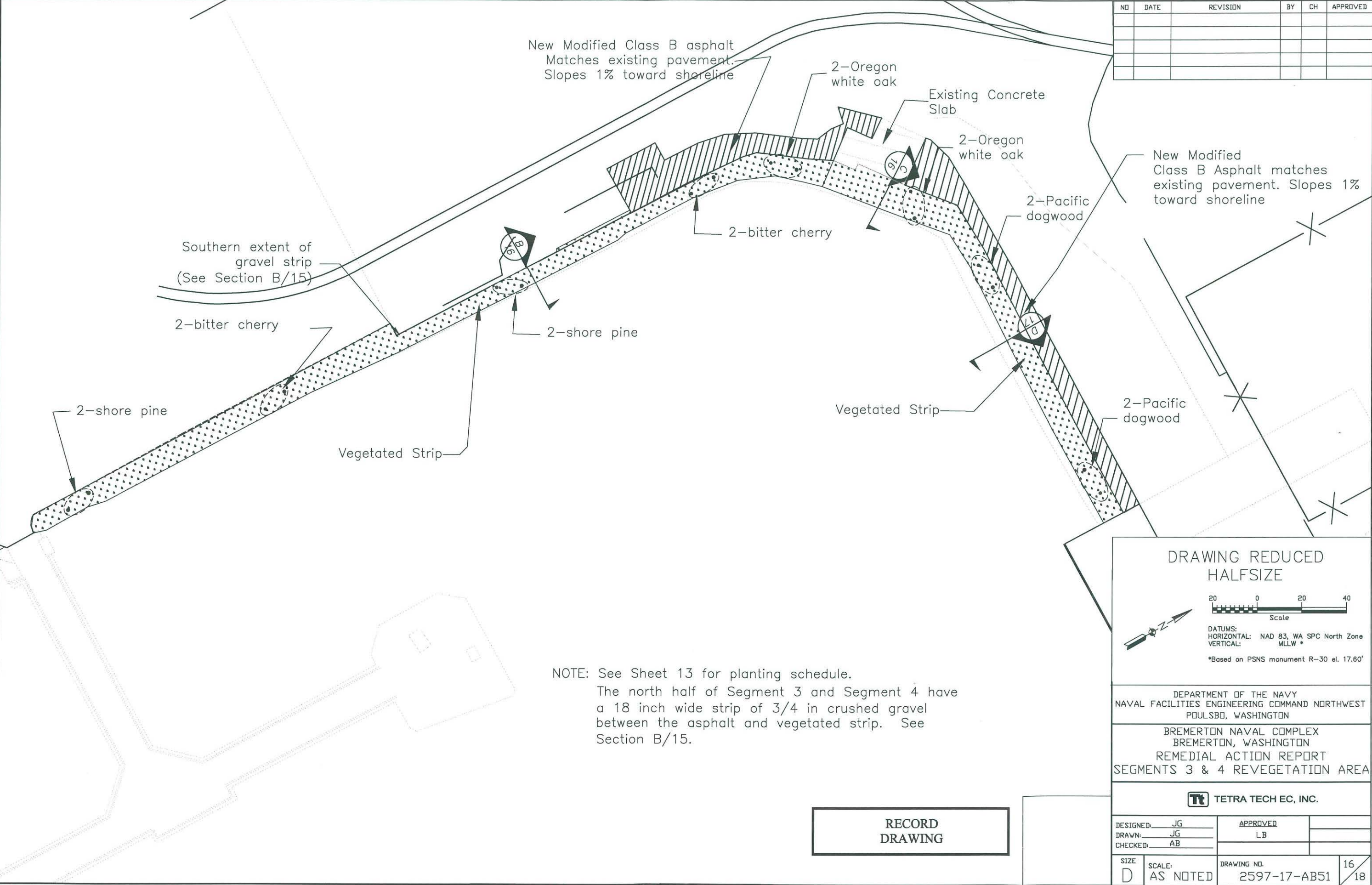
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SCALE:
AS NOTED

DRAWING NO.
2597-17-AB51

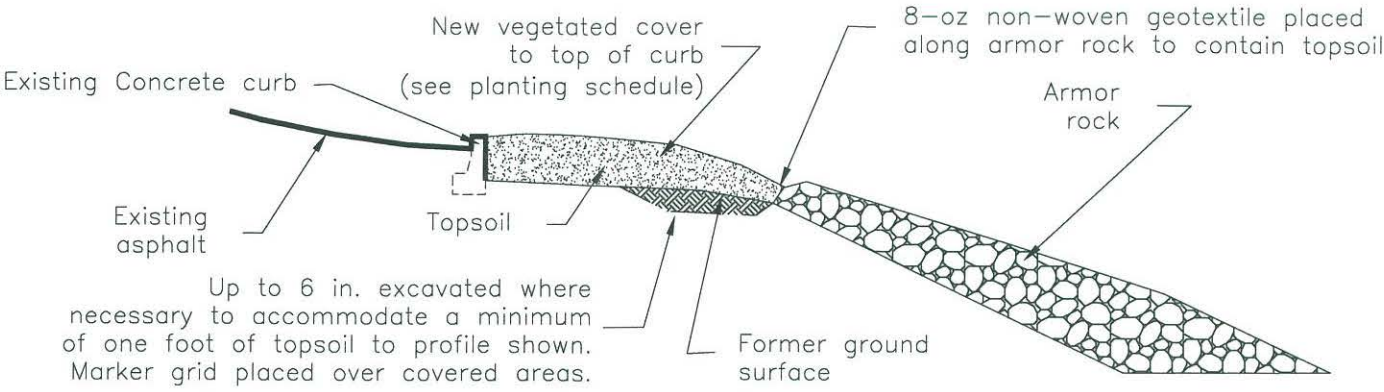
15
18

NO	DATE	REVISION	BY	CH	APPROVED



\\\\Poulsbo\\Projects\\TO 17\\Deliverables\\Remedial Action Report\\Internal Draft (All Segments)\\Drawings\\2597-17-AB51.dwg

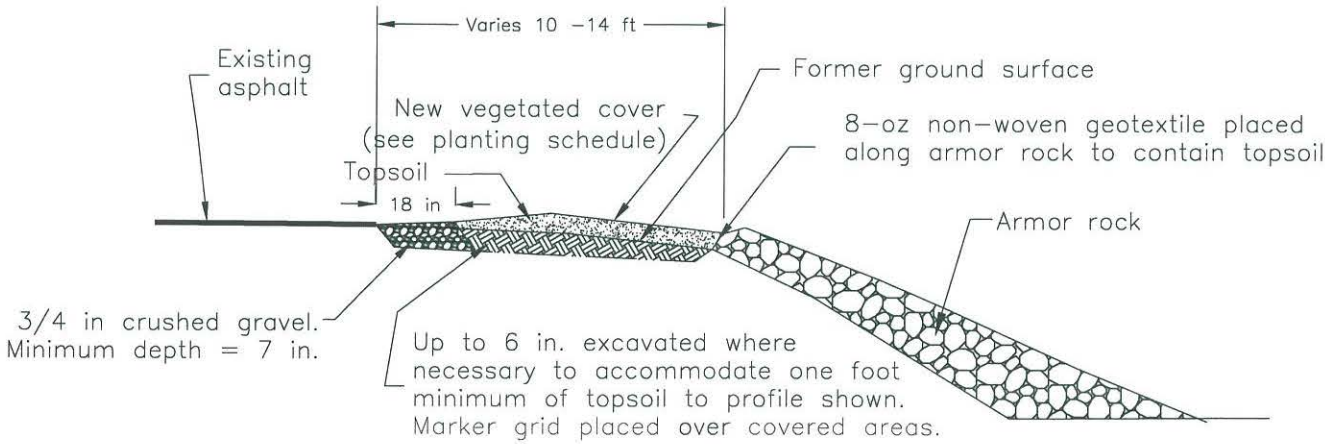
NO	DATE	REVISION	BY	CH	APPROVED



TYPICAL SECTION

N. T. S.

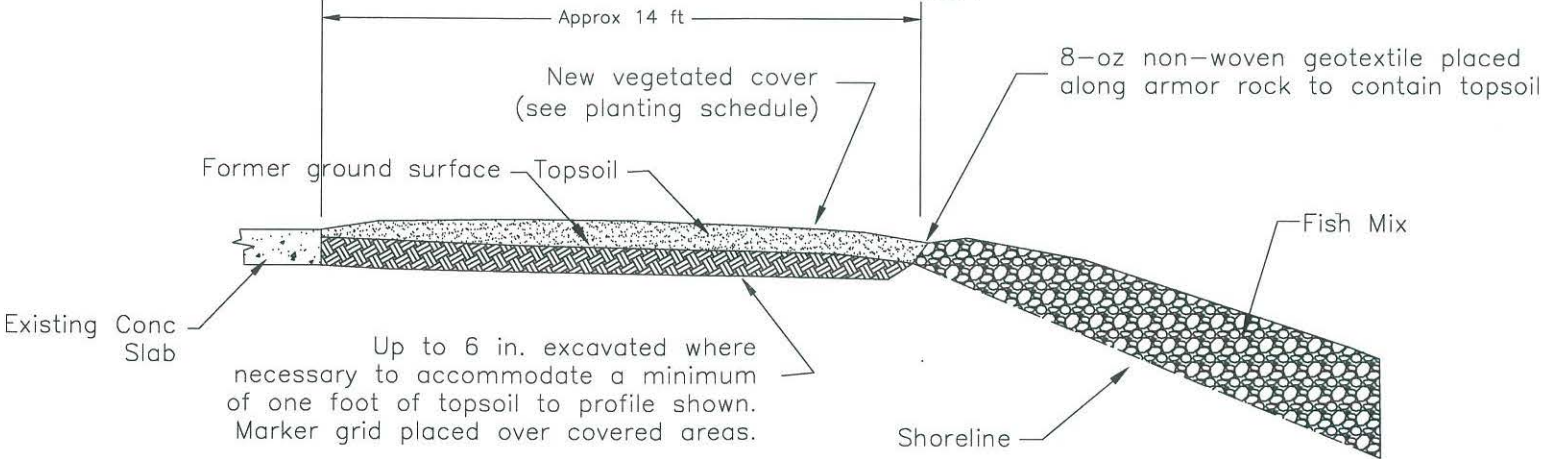
A
13



TYPICAL SECTION

N. T. S.

B
14



TYPICAL SECTION

N. T. S.

C
14

RECORD
DRAWING

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND NORTHWEST
POULSBORO, WASHINGTON

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
REMEDIAL ACTION REPORT
SEGMENTS 2,3,4 REVEGETATION SECTIONS

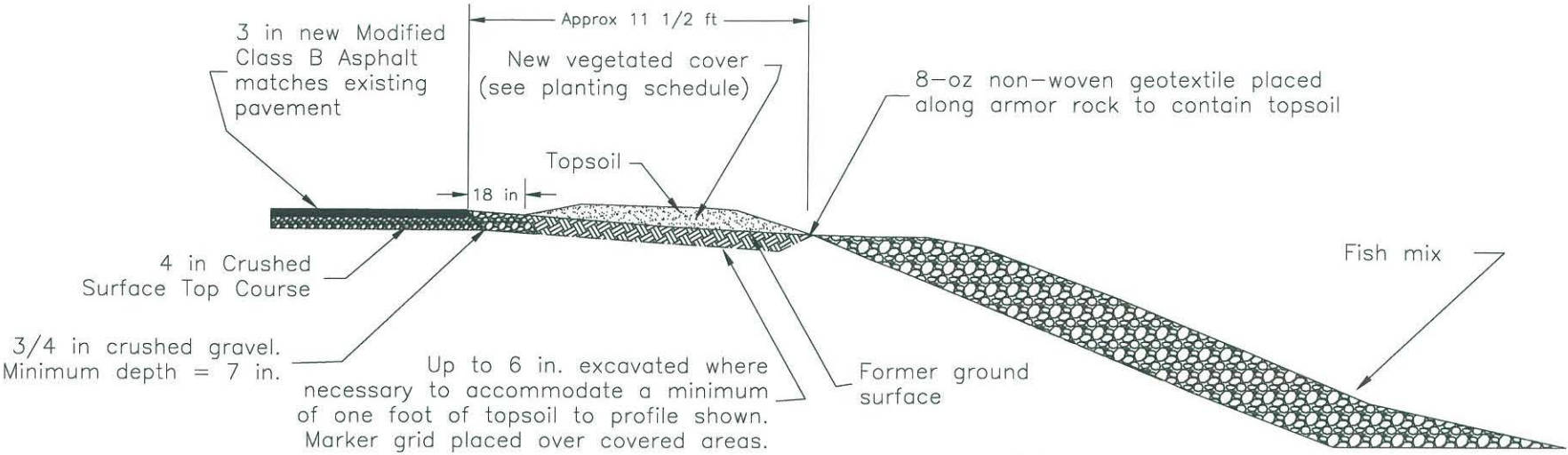
TETRA TECH EC, INC.

DESIGNED: JG
DRAWN: JG
CHECKED: AB

APPROVED
LB

SIZE D
SCALE: No Scale
DRAWING NO. 2597-17-AB51
17/18

\\\\Poulsbo\\Projects\\TO 17\\Deliverables\\Remedial Action Report\\internal Draft (All Segments)\\Drawings\\2597-17-AB51.dwg



TYPICAL SECTION
N. T. S.

D
14

NO	DATE	REVISION	BY	CH	APPROVED

RECORD
DRAWING

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND NORTHWEST
POULSBORO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON
REMEDIAL ACTION REPORT
SEGMENT 4 REVEGETATION SECTION

Tt TETRA TECH EC, INC.

DESIGNED: JG	APPROVED: LB	
DRAWN: JG		
CHECKED: AB		
SIZE: D	SCALE: No Scale	DRAWING NO. 2597-17-AB51 18/18

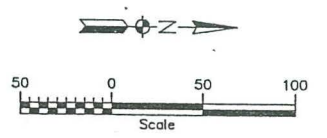
Segments 18 and 19

NO	DATE	REVISION	BY	CH	APPROVED
1	2/28/00	ISSUE FOR BID	REW	PRM	WE
2	3/10/00	DREDGE PLAN MODIFICATION	REW	PRM	GH
3	4/21/00	DATUM CLARIFIED, ADDED NOTE 2	REW	PRM	WE
RONALD E. WILLS, WA PE#28736					

**APPROVED FOR
CONSTRUCTION**

**DRAWING REDUCED
HALFSIZE**

- NOTES:
- DEBRIS ON THE SLOPE CONSISTING OF LOGS, SCRAP STEEL, CONCRETE BLOCKS AND RUBBLE AND THE LIKE SHALL BE REMOVED AS DIRECTED BY THE FWENC REPRESENTATIVE AND TRANSPORTED TO THE DESIGNATED ON-SITE STORAGE AREA.
 - THERE IS AN EXPOSED INSULATED WATER LINE APPROXIMATELY 8-INCHES IN DIAMETER NEAR THE TOP OF THE SLOPE. THIS PIPE SHALL BE PROTECTED WHEN PLACING THE RIPRAP. SMALLER SIZES OF RIPRAP OR QUARRY SPALLS SHOULD BE HAND PLACED IN THE AREA OF THE PIPE.



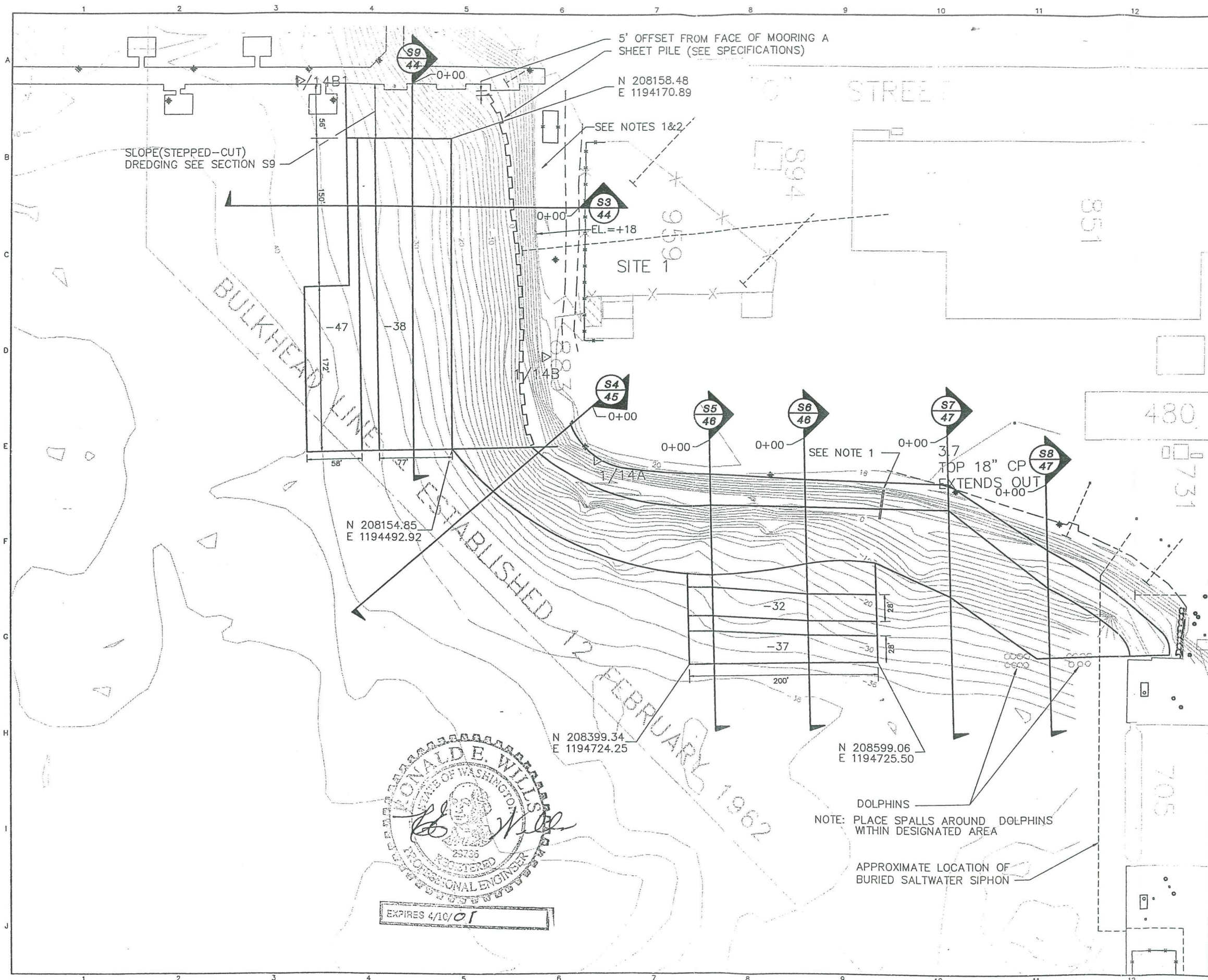
DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *
*Based on PSNS monument R-30 el. 17.60'

DEPARTMENT OF THE NAVY
 NAVAL FACILITIES ENGINEERING COMMAND
 ENGINEERING FIELD ACTIVITY, NORTHWEST
 PULSBO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
 BREMERTON, WASHINGTON
SITE 1 PLAN

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

DESIGNED: REW/PRM	APPROVED		
DRAWN: AEC			
CHECKED: PRM			
SIZE: D	SCALE: AS NOTED	NAVFAC. DRAWING NO. MD67FG04	43/50



I:\PROJECTS\14536700\DWG\MD67FG04.DWG
PLOT/UPDATE: APR 21 2000 14:35:28

NAVY RAC PROJECT
CONTRACT NO. N44255-93-D-4050
FIELD CHANGE REQUEST (FCR)

CONTROLLED COPY

DELIVERY ORDER NAME OU B MARINE REMEDIAL ACTION and FY00 PROJECT P-338	DELIVERY ORDER # DO 67/78	CHANGE REQUEST NO. 17 DATE 9/25/00 This document is a copy. It is preceded by a revised copy. It must be destroyed or clearly marked as such.
TO NAVY NTR/RPM/COTR JAI JEFFERY/ JIM TENNYSON/ BILL CLARNO	LOCATION BNC	DATE 21 SEPTEMBER 2000

RE:	SEE ATTACHED SKETCH Drawing No. MD67FG04, SHEET 44 <i>Row 3</i>	Title _____
<input checked="" type="checkbox"/> X	Spec Section NA	Title _____
	Other NA	Title _____

1. DESCRIPTION (Items involved, submit sketch, if applicable):

Add toe trench to base of rock slope at Site 1.
 Applies to Cross sections S3, through S8 on Drawing ~~44 of 50~~ **44 THROUGH 47 OF 50** *9/22/00*

2. REASON FOR CHANGE

General Construction recommended addition of trench in a letter dated September 19, 2000. FWENC agrees with addition to facilitate placement of rock on the slope

3. RECOMMENDED DISPOSITION (Submit sketch, if applicable):

☒ **XX** Minor Change ☐ Major Change Impacts Costs, Schedule or Technical

3a. Will this change result in a contract cost or time change? ☐ Yes ☒ **XX** No

3b. Estimate of cost or time charge (if any) ☐ none

PREPARER (Signature) <i>MA I dtt</i>	Date 9/21/00	PREPARER'S TITLE Delivery Order Manager	SITE SUPERINTENDENT (Signature) SEE ATTACHED	Date <i>Jo 9-22-00</i>
---	------------------------	--	--	---------------------------

4. DISPOSITION

☐ Not approved (give reason).
☒ Considered minor change – approved per Recommended Disposition – Documents will not formally be revised, field to maintain as-built records.

Considered major change – Navy approval required via contract modification process.

1) FOSTER WHEELER ENVIRONMENTAL DESIGN MANAGER (Signature) <i>W. H.</i>	DATE 9-21-00	2) FOSTER WHEELER ENVIRONMENTAL DELIVERY ORDER MANAGER (Signature) <i>MA I dtt</i>	Date 9/21/00
Comments (attached) <input checked="" type="checkbox"/> No Comments		Comments (attached) <input type="checkbox"/> No Comments	
3) HEALTH AND SAFETY MANAGER (Signature) (IF HEALTH AND SAFETY RELATED) NA	DATE	4) QC REVIEWER (Signature) <i>S. J.</i>	Date 9-22-00
Comments (attached) <input type="checkbox"/> No Comments		Comments (attached) <input checked="" type="checkbox"/> No Comments	

Delivery Order Manager distributes to:

Foster Wheeler Design Manager Contracts Manager QC Manager FCR Preparer
 Senior Technical Manager Site Superintendent Project Controls Supervisor Program Health and Safety Manager

TUE TRENCH DETAIL

QUARRY SPALLS

H

W

H = 4 FT

W = BUCKET WIDTH

FILTER ROCK

A = VARIABLE SLOPE

REQUIRED DEPTH -38

REQUIRED DEPTH -47

1' OVERDEPTH

EXISTING BED

DREDGE LIMIT

200'±

F102

TOP OF BANK EL. = +18

NEW RIP-RAP

EL. = +0.0

INSTALL SHEET PILES
TOP ELEVATION +2.0 FT
TIP ELEVATION -78 FT

1' MINIMUM WOFW FISH MIX

EL. = -5.0

PLACE 1' QUARRY SPALLS ON NEW SLOPE

1' MINIMUM FILTER ROCK UNDER QUARRY SPALLS

DREDGE LIMIT

EXISTING RIP-RAP SLOPE

EL. = 0.0
BOTTOM OF RIPRAP,
TOP OF QUARRY SPALLS

SECTION

S3
43

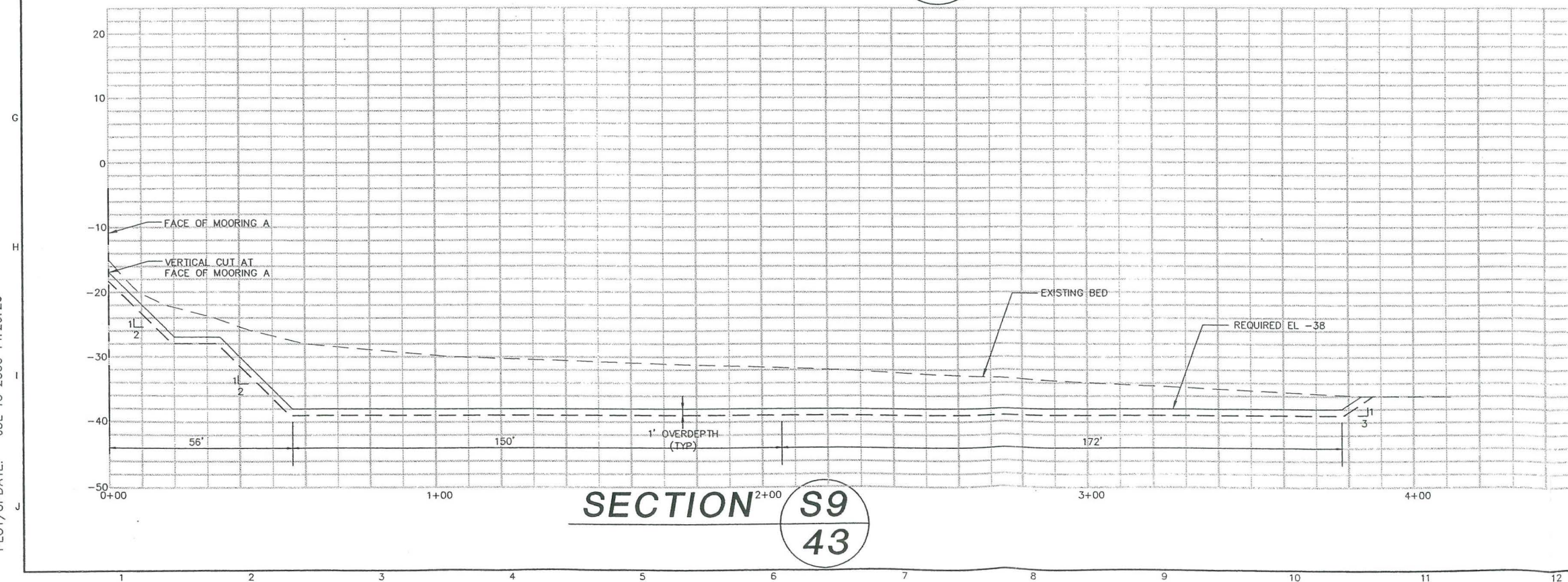
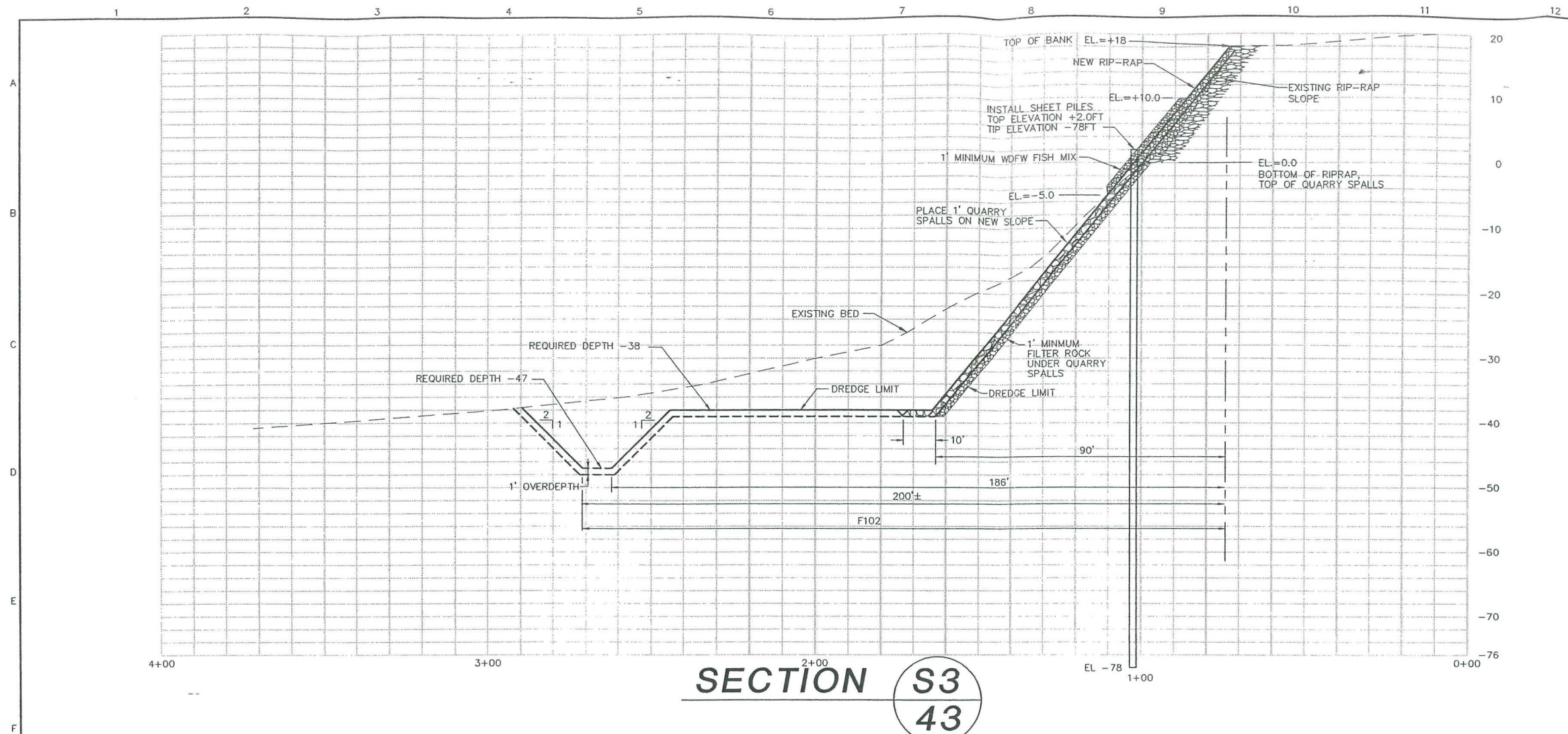
TUE TRENCH DETAIL
9/21/06

SHEET 44/50

— FACE OF MOORING A

— VERTICAL CUT AT
FACE OF MOORING A

I:\PROJ\14536700\DWG\MD67FG04.DWG
PLOT/UPDATE: JUL 10 2000 14:29:26



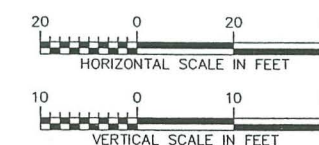
NO	DATE	REVISION	BY	CH	APPROVED
1	2/28/00	ISSUED FOR BID	REW	PRM	WE
2	3/10/00	DREDGE PLAN MODIFICATION	REW	PRM	GH
3	4/21/00	DATUM CLARIFIED, REVISED SECTION S3 RONALD E. WILLS, WA PE#28736	REW	PRM	WE
4	7/12/00	ADDED WDFW FISH MIX, FILTER ROCK	REW	PRM	MTD

APPROVED FOR
CONSTRUCTION

DRAWING REDUCED
HALFSIZE

[Signature]

[Stamp]



DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *

*Based on PSNS monument R-30 el. 17.60'

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY, NORTHWEST
POULSBORO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON
SECTION S3, S9

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

DESIGNED: REW/PRM
DRAWN: AEC
CHECKED: PRM

APPROVED
WE

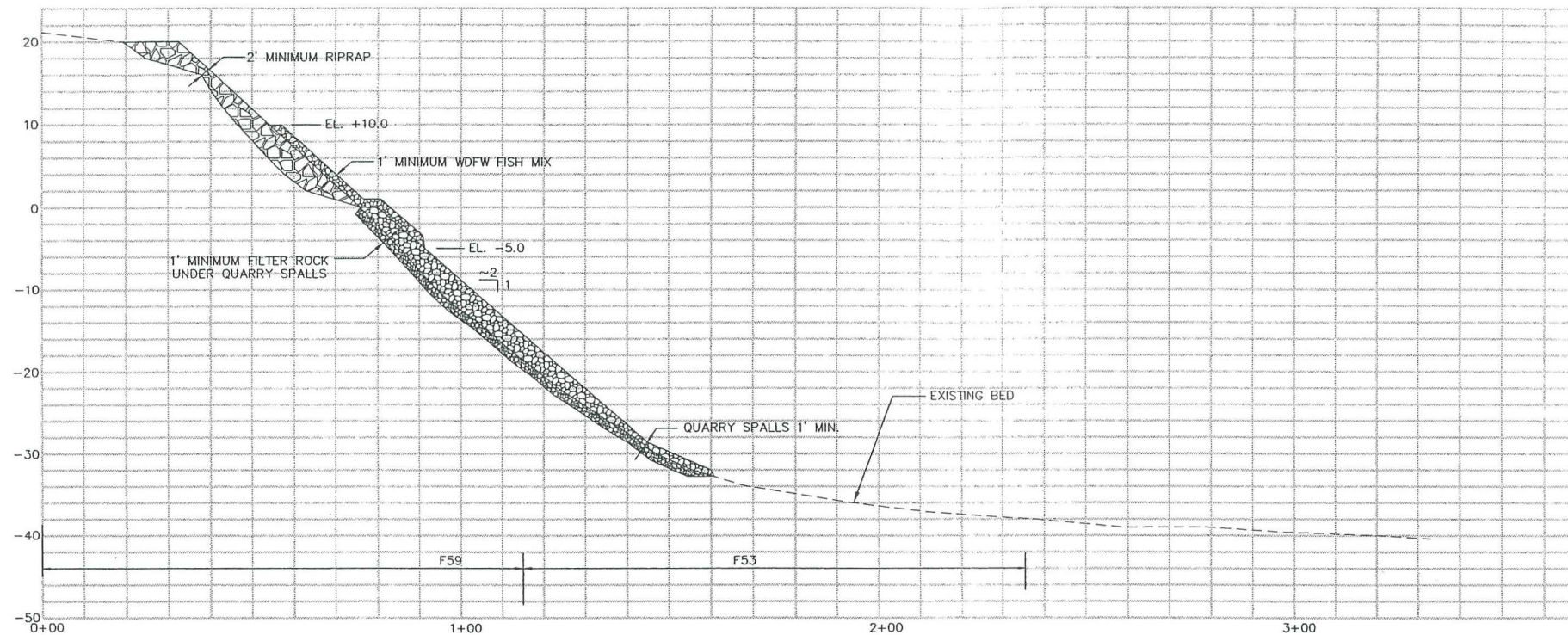
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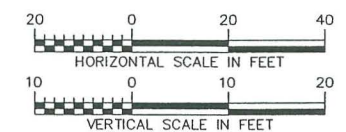
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43

NO	DATE	REVISION	BY	CH	APPROVED
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3	7/12/00	ADDED WDFW FISH MIX AND FILTER ROCK	REW	PRM	MTO

APPROVED FOR
CONSTRUCTION

DRAWING REDUCED
HALFSIZE

BB *Wills*



DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *

*Based on PSNS monument R-30 el. 17.60'

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY, NORTHWEST
POULSBORO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON

SECTION S4, DO#67

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

DESIGNED: REW/PRM
DRAWN: AEC
CHECKED: PRM

APPROVED
WE

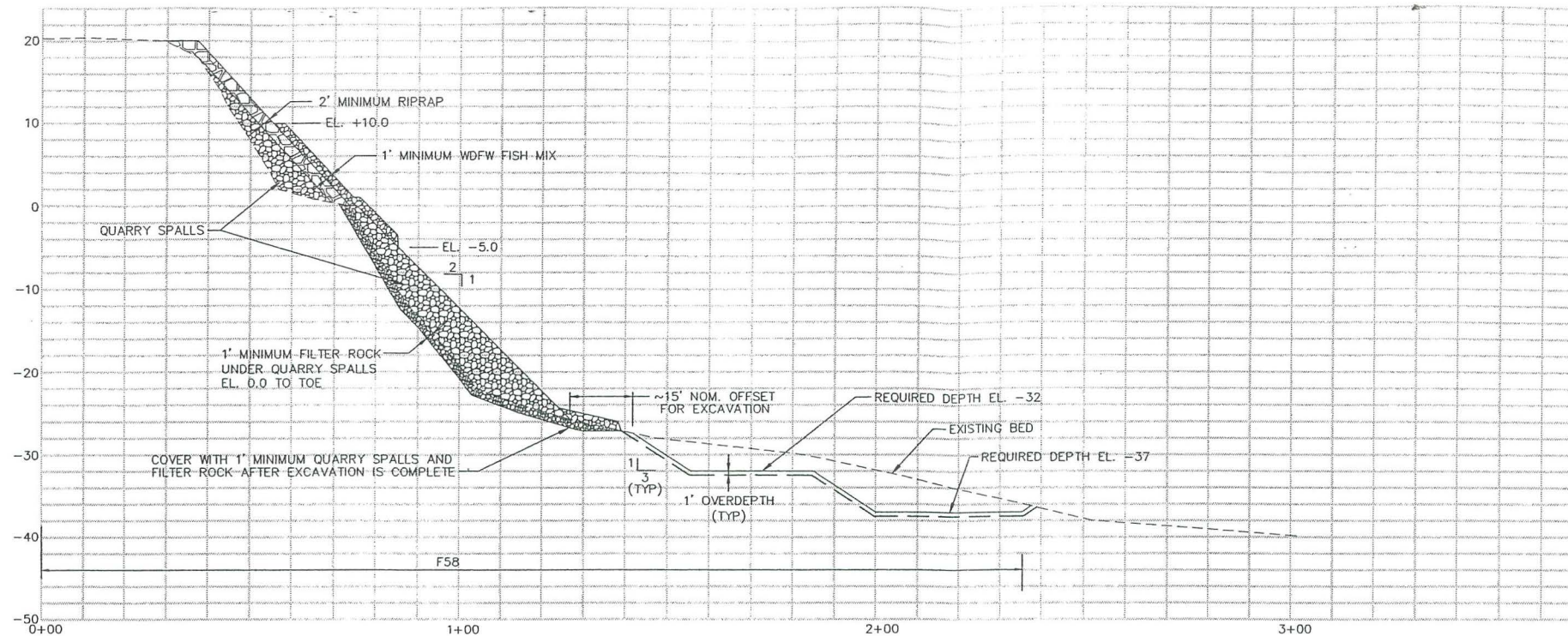
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MD67XS05

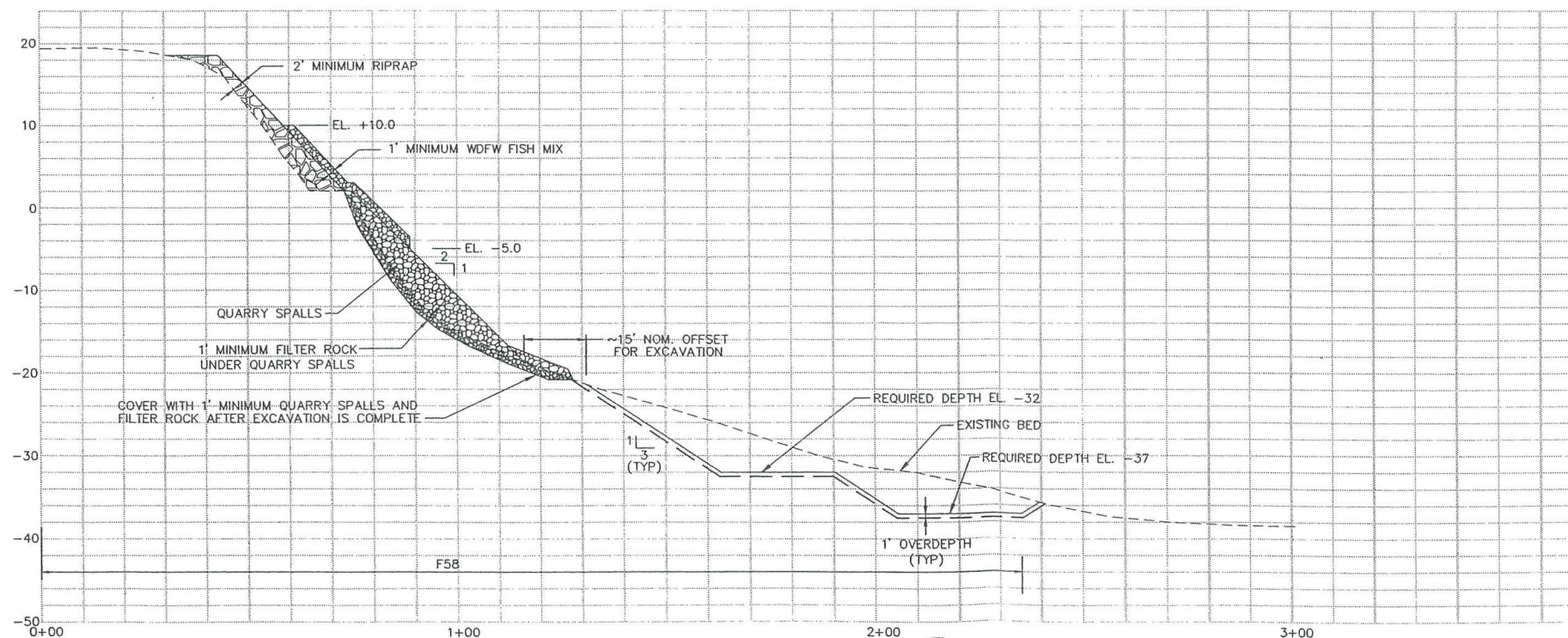
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SECTION

S5
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SECTION

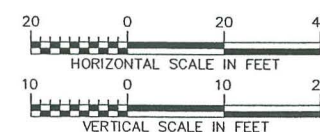
S6
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2	4/21/00	DATUM CLARIFIED, RONALD E. WILLS, WA PE#28736	REW	PRM	WE
3	7/12/00	ADDED WDFW FISH MIX AND FILTER ROCK	REW	PRM	MTD

APPROVED FOR
CONSTRUCTION

DRAWING REDUCED
HALFSIZE

RE Wills



DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *

*Based on PSNS monument R-30 el. 17.60'

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ENGINEERING FIELD ACTIVITY, NORTHWEST
POULSBORO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON

SECTION S5 & S6, DO#67

FOSTER  WHEELER
ENVIRONMENTAL CORPORATION

DESIGNED: REW/PRM
DRAWN: AEC
CHECKED: PRM

APPROVED
WE

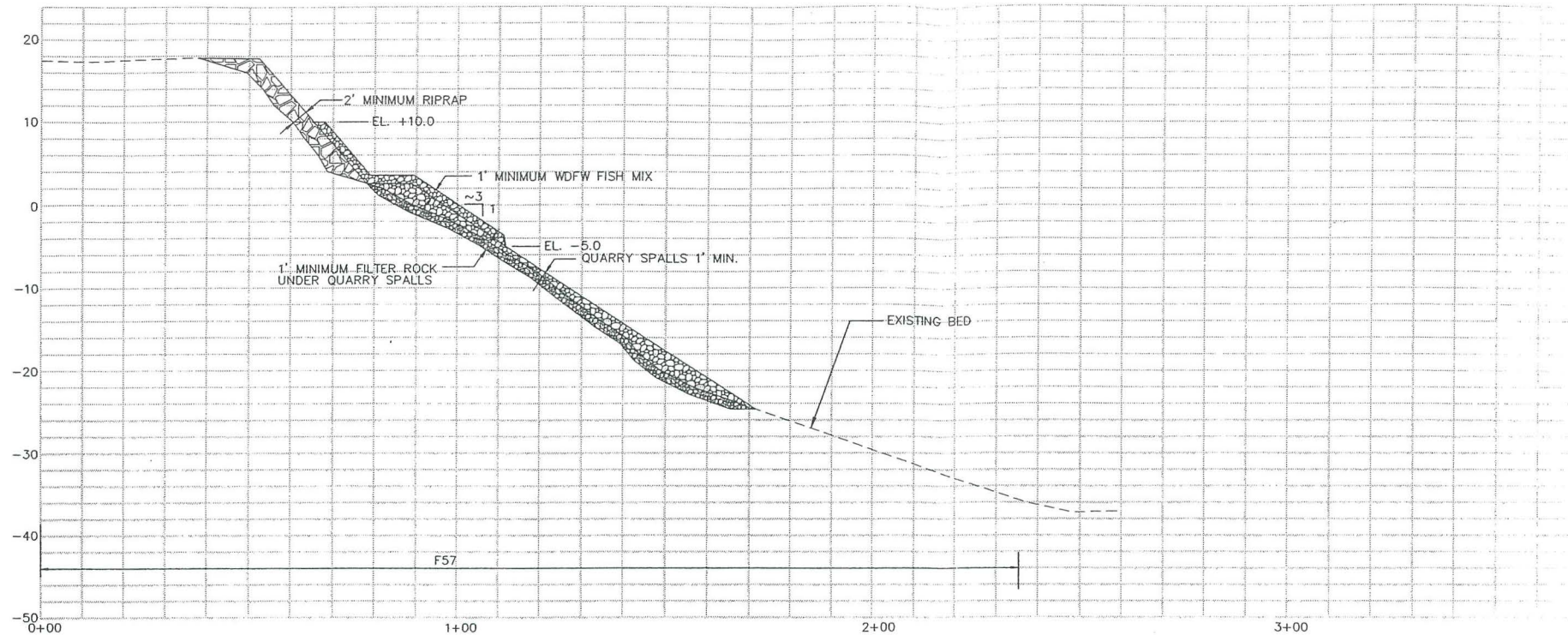
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SCALE:
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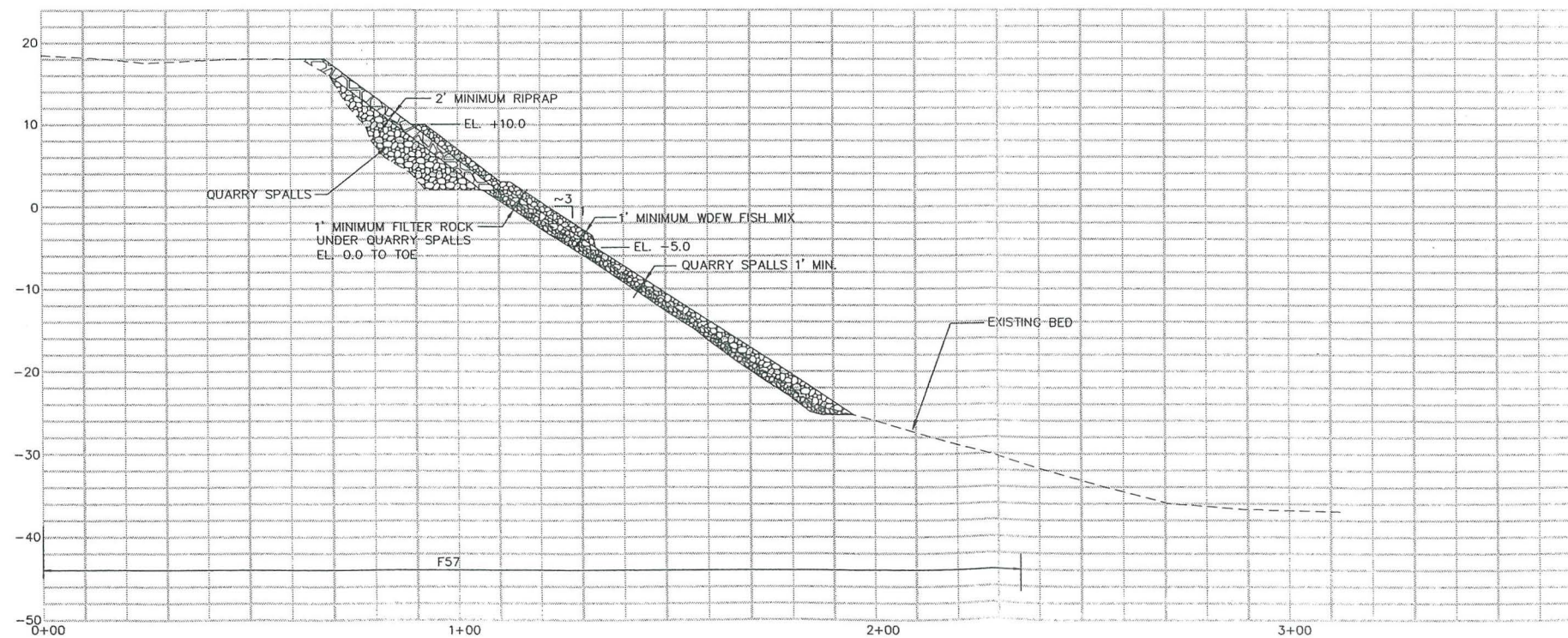
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SECTION **S7**
43



SECTION **S8**
43

NO	DATE	REVISION	BY	CH	APPROVED
1	2/28/00	ISSUE FOR BID	REW	PRM	WE
2	4/21/00	DATUM CLARIFIED, RONALD E. WILLS, WA PE#28736	REW	PRM	WE
3	7/12/00	ADDED WDFW FISH MIX AND FILTER ROCK	REW	PRM	MTO

APPROVED FOR
CONSTRUCTION

DRAWING REDUCED
HALFSIZE

RE Wills

DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *
*Based on PSNS monument R-30 el. 17.60'

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY, NORTHWEST
POULSBORO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON

SECTION S7 & S8, DO#67

FOSTER WHEELER ENVIRONMENTAL CORPORATION		APPROVED WE	
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K. Removal of Mooring A-11.

The subcontractor shall remove Mooring A-11, including its anchor components and hardware, place on a flat-deck haul barge, wash off all of the adhering sediment, transport to the designated project storage site, unload, and place in the project storage area at a location designated by the FWENC Representative. A removal procedure is described on sheet 49 of 50. FWENC will arrange for the mooring buoy assembly to be delivered off-site for permanent storage and so care shall be exercised by the subcontractor so as not to damage the mooring buoy or its anchor components. A new Bid Item No. 18, Remove Mooring A-11 with a lump sum quantity is established for this element of the work.

L. Add DMMU F78 to CERCLA dredging.

Based on criteria set forth in section 15 of the ROD (Responsiveness Summary Comment 10 response, page 15-8), a new DMMU on the west side of Pier 5 is required to be dredged as shown in the revised plan and new sectional view on Sheets 3 of 50, 18 of 50 and 27 of 50. As a result of this change, a new Bid Item No. 5a, Dredge Additional CERCLA Sediment in Units F78 and F88 and Dispose at CAD Site is established. The size of the CAD pit will not be increased to accommodate this change.

M. Add DMMU F88 to CERCLA dredging.

Based on criteria set forth in section 15 of the ROD, a new DMMU on the west side of Pier 7 is required to be dredged as shown in revised plan view and relocated sectional view on Sheets 3 of 50, 19 of 50 and 30 of 50. As a result of this change, a new Bid Item No. 5a, Dredge Additional CERCLA Sediment in Units F78 and F88 and Dispose at CAD Site is established. The size of the CAD pit will not be increased to accommodate this change.

N. Install Washington Department of Fish and Wildlife (WDFW) Fish Mix at OU A.

The WDFW fish mix shall be placed over the thin cap at OU A between approximate elevations +1 foot MLLW and -6 feet MLLW as shown on revised drawings 41 of 50 and 42 of 50. The WDFW fish mix consists of 1-inch minus rounded gravel in the size range shown below.

Fish Mix. Fish Mix shall meet the following particle size distribution:

Mesh Size (Standard Sieve)	Percent Passing
1- inch	100
1/2 inch	80-100

3/8 inch	40-80
US Number 8	25-60
US Number 16	15-35
US Number 20	10-20
US Number 40	2-8

Fish Mix shall not be derived from blasting or crushing operations. This aggregate will be well graded, round and smooth, free of organic debris, material from a gravel or sand pit. The Contractor shall provide submittals for the fish mix as specified in Section 02483, including test reports, 10-gallon sample, and source identification. The material shall be placed using a floating crane and rock skip as specified for the Fish Rock Habitat Mix (thin cap) material. A new Bid Item No. 19, Fish Mix is established

O. Change Upper Limit of Thin Cap at OU A.

The top of the thin cap is to be lowered from elevation +18 feet MLLW to elevation +0.0 feet MLLW as reflected on revised drawings 41 of 50 and 42 of 50. The lower elevation of - 6 feet MLLW remains the same. As a result of this change, Bid Item No. 9, Fish Rock Habitat Mix, is deleted and a new Bid Item No. 9a, Fish Rock Habitat Mix (Revised Quantity) is established.

P. Place Filter Rock under Rock Spalls at Site 1.

A one-foot-thick blanket of filter rock will be placed on the existing slope prior to placement of the rock spalls at Site 1. The layer of filter rock will be placed from approximate elevation 0.0 feet MLLW to the toe of quarry spalls as shown on revised drawings 44 of 50 through 47 of 50. The filter rock consists of sand and gravel with the following size range:

Filter Rock. Filter rock shall meet the following gradation:

Mesh Size (Standard Sieve)	Percent Passing
4 inch	90-100
1/2 inch	40-60
3/8 inch	10-20
US Number 10	5-10
US Number 200	0-5 (wet sieve)

The stone used for the filter rock shall conform to the requirements for riprap and quarry spalls in Section 02270, Slope Protection, and shall be a crushed product. The Contractor shall provide submittals for the filter rock as specified in Section 02270, including a 10-

gallon sample, test reports and identification of source. The material shall be placed using a floating crane and rock skip as specified for quarry spalls. Materials shall be well graded so that smaller pieces can chink in around larger stones and create a dense mass with minimal void space. Rounded stones are not acceptable for use in this application. A new Bid Item No. 20, Filter Rock, is established.

Q. Install Washington Department of Fish and Wildlife (WDFW) Fish Mix at Site 1.

Place a one-foot blanket of WDFW fish mix over the riprap and quarry spalls at Site 1 between approximate elevations +10 feet MLLW and -5 feet MLLW as shown on revised drawings Sheet 44 of 50 through Sheet 47 of 50. The specifications for the fish mix and method of placement are described in Work Item 5 above for this Change Order No. 1. A new Bid Item No. 19, Fish Mix is established

R. Standby Time

The standby time included in the original scope of work was intended to be used for standby time incurred by the D. B. *Seattle* while dredging in berth areas. With the addition of a third plant (D.B. *Olympia*) and the potential for standby to occur anywhere on the project site, Bid Item 21, Standby Time for Either the D.B. *Tacoma* or D.B. *Olympia* is added. Standby time for this item will be calculated in accordance with paragraph 1.01H of this specification

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

The provisions and intent of the contract, including the General Conditions, apply to this work as if specified in this section. Work related to this section is described in

SECTION 01300 SUBMITTALS
SECTION 02482 DREDGING AND DISPOSAL
SECTION 02464 PILING

1.02 DESCRIPTION OF WORK

The work includes furnishing all material, labor and equipment necessary for providing the rock riprap on the slope just east of Mooring A as shown on the drawings and described in this specification.

1.03 APPLICABLE PUBLICATIONS

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

- A. American Society for Testing and Materials
ASTM-C-127 Specific Gravity and Absorption of Coarse Aggregate
- B. U.S. Department of the Army, Corps of Engineers,
Specifications
 - CRD-C-114-73 Method of Test for Soundness of Aggregates by Freezing and Thawing of Concrete Specimens
 - CRD-C-148-69 Method of Testing Stone for Expansive Breakdown on Soaking in Ethylene Glycol

1.04 SUBMITTALS

Submit samples of the following:

- A. Riprap material

Submit test reports of riprap materials for the following:

- A. Specific gravity
- B. Absorption
- C. Soundness
- D. Expansive breakdown
- E. Freeze-thaw

1.05 CONSTRUCTION FACILITIES

If material is barged to the site, navigation aids and lights for all marine equipment or facilities shall be installed and maintained as required by and in a manner satisfactory to the U.S. Coast Guard.

PART 2 - PRODUCTS

2.01 MATERIAL SOURCES

Riprap rock and quarry spalls shall be selected materials from an existing commercial source which meets the quality requirements specified below.

2.02 GENERAL REQUIREMENTS

All rock shall be sound, clean, angular, durable stone. The longest dimension of any stone shall not exceed three times its shortest dimension. Acceptability of stones will be determined by laboratory tests, as hereinafter specified, geologic examination, and service records.

2.03 EVALUATION TESTING

The Subcontractor shall submit to the FWENC Representative all pertinent test results and service records from the proposed source. These test results shall be recent (less than 9 months old) and include specific gravity, absorption, accelerated expansion, and freezing and thawing. The tests shall be performed in accordance with, and meet the requirements of paragraphs Rock Quality, Accelerated Expansion, and Freezing and Thawing specified herein. In addition, the Subcontractor shall also submit samples of the rock proposed for use which shall be selected in the presence of the FWENC Representative. Samples shall consist of 150 pounds of rock pieces ranging in size from 4 inches to 10 inches. The presence of the FWENC Representative during selection of samples of the rock will not relieve the Subcontractor of the responsibility to secure representative samples. Satisfactory Subcontractor documentation of laboratory test results on rock samples will not constitute approval of all rock in the quarry and will not in any way change the Subcontractor's responsibility for obtaining and developing a

satisfactory source of rock. Throughout the duration of this work, the FWENC Representative may sample and test rock delivered to the worksite and proposed for use in the construction. Rock failing to meet specified requirements will be removed from the worksite by the Subcontractor at their cost.

2.04 ROCK QUALITY

All riprap rock delivered to and incorporated in the project shall meet the following minimum specifications:

- | | | |
|-----|--|---------------------------------------|
| (1) | Specific gravity (BSSD)
ASTM-C-127 | 2.60 minimum |
| (2) | Absorption
ASTM-C-127 | Not more than 3 percent |
| (3) | Accelerated Expansion
(CRD-C-148) | Not more than 15 percent
breakdown |
| (4) | Freezing and Thawing
100 cycles (CRD-C-114) | Not more than 10 percent
loss |

A. Accelerated Expansion (15 Days)

The test sample will be tested in accordance with Corps of Engineers Testing Procedure CRD-C-148, except as herein specified. Testing procedure for sample size in CRD-C-148 shall be modified as follows: "The test sample shall be from 4950 grams to 5050 grams of 2-inch to 1-1/2 inch sized pieces." Test results will be computed by dividing the number of pieces that break down by the number of pieces in the original test sample. Failure or breakdown is defined as any piece separating into two or more pieces or losing sufficient surface material to allow it to pass through the 1-1/2-inch sieve. Maximum allowable breakdown is 15 percent over a period 15 days. Weight loss based on the original oven dry weight shall be recorded.

B. Freezing and Thawing

Test sample, consisting of 10 pounds of pieces passing the 2-inch sieve and retained on 1-1/2-inch sieve will be prepared by jaw crushing or hand chipping with all sharp edges chipped off and only pieces of approximately cubical shape used. Original dry weight of pieces selected for freeze-thaw test will be computed by determining moisture content of room-dry rock from representative surplus or undersized pieces.

$$\text{Dry weight of pieces for freeze thaw} = \frac{\text{Weight room-dry}}{\frac{\text{MG in \%}}{100}}$$

Specimens will be immersed in water for 24 hours prior to start of test. Sample is placed in a pan approximately 15 by 9-1/2 by 1-1/4 inches and the pan filled to 1/4-inch to 1/2-inch depth with water. Sample in pan is subjected to freezing and thawing in freeze-thaw apparatus described in CRD-C-114 at the rate of 12 cycles per day, one cycle consisting of approximately 1 hour in alcohol solution at $0 \pm 2^{\circ}$ F and 1 hour in solution at 40 ± 2 degrees F. The pan shall be suspended to a depth of 1/2 to 1 inch in the alcohol solution. Sample will be tested for 100 cycles. At the end of the 100 cycles, the sample shall be washed, dried, sieved over the 1-1/2 inch sieve, and weighed. The percent loss shall be computed based on the original dry weight.

2.05 ROCK GRADATION

A Riprap Rock

The rock riprap shall conform to the following gradation requirements for Corps of Engineers Class III Riprap.

<u>WEIGHT</u> <u>LBS</u>	<u>% HEAVIER</u>
800	0
400	25-35
200	70-80
*25	85-90

* Stones under this size must not exceed 10% by weight.

B. Quarry Spalls

Quarry spalls shall conform to Section 9-13. 6 of the WSDOT Standard as shown below:

Quarry Spalls:

<u>Sieve Size</u>	<u>Percent Passing (by weight)</u>
8-inch	100
3-inch	40 max
3/4-inch	10 max

2.06 ACCEPTANCE OF MATERIALS

Materials will be inspected at the jobsite prior to placement. Subcontractor shall be responsible for meeting rock specifications. Materials which do not meet size or quality as previously specified will be rejected and no payment will be made regardless of any general or provisional acceptance of materials from a stockpile or quarry source.

PART 3 - EXECUTION

3.01 DEBRIS ON EXISTING SLOPES

Prior to placement of quarry spalls or riprap at Site 1 the subcontractor shall remove and salvage all debris that would prevent the rock from keying in to the underlying riprap as determined by the FWENC Representative. Debris on the existing slopes generally consists of logs, metal, corrugated pipe, concrete blocks.

3.02 PLACING QUARRY SPALLS

Quarry spalls at Site 1 shall be placed to the lines, grades and thicknesses shown on the contract drawings. No slope preparation other than removal of debris will be performed. Placing of material by methods which tend to segregate particle sizes will not be permitted. Placement shall be made in a manner that will produce a smooth blanket. On slopes, the material shall be placed by starting at the bottom of the slope and working up to the top. Any displacement of quarry spalls by waves or tidal action shall be repaired prior to placement of the riprap slope protection; displacement of quarry spalls in areas not covered by riprap shall be repaired prior to acceptance of the work.

3.03 PLACING OF RIPRAP ROCK MATERIALS

The intent of this work is to provide a compact blanket of rock riprap over the slope where shown on the drawings. Rock riprap shall be placed in a manner which will produce a close-fitting and well-keyed mass of rock with minimum percentage of voids and shall be constructed to the lines, grades, and thicknesses shown. The riprap shall be placed over the existing slope to its full course thickness in one operation and in such a manner as to avoid displacing the underlying material. Placing the riprap by any method likely to cause segregation will not be permitted. The larger rock shall be well distributed and all the rock shall be so placed and distributed that there will be no large accumulation or areas composed predominately of either the larger or smaller pieces of rock. Hand placing or rearranging of individual rock by mechanical equipment may be required to secure results specified above. There shall be no loose or unkeyed rocks on the slope and any unkeyed rock shall promptly be removed or repositioned. A tolerance from slope lines of minus 0.5 or plus 1 foot from top elevations and from slope lines shown on the drawings will be allowed in finished surface, except that either extreme of such tolerance shall not be continuous over an area greater than 200 square feet.

In general, all slope protection materials shall be placed from the lower elevations to the higher elevations. Desired distribution of various sizes of stones throughout the mass shall be obtained by selective loading at quarry.

3.04 MAINTENANCE

The Subcontractor shall maintain the riprap blanket until accepted and any material displaced by any cause shall be replaced to the lines and grades shown at no additional cost to FWENC and the Navy.

END OF SECTION

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

The provisions and intent of this contract, including the General Conditions, apply to this work as if specified in this section. Work related to this section is described in

SECTION 1300 SUBMITTALS
SECTION 02482 DREDGING AND DISPOSAL
SECTION 02700 SLOPE PROTECTION

1.02 DESCRIPTION OF WORK

The work includes all material, labor and equipment necessary to furnish and install sheet metal piling retaining wall at near the middle of the slope just east of Mooring A as shown on the drawings and described in this specification.

1.03 APPLICABLE PUBLICATIONS

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 6/A 6M	(1995b) General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A 328/A 328M	(1993a) Steel Sheet Piling
ASTM A 572/A 572M	(1994c) High-Strength Low-Alloy Columbium-Vanadium Structural Steel

1.04 SUBMITTALS

FWENC approval is required for all submittals with a "EN" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTALS.

A. Metal Sheet Piling; EN.

Detail drawings for sheet piling including fabricated sections shall show complete piling dimensions and details, driving sequence and location of installed piling. Detail drawings shall include details and dimensions of templates and other temporary guide structures for installing piling. Detail

drawings shall provide details of the method of handling piling to prevent permanent deflection, distortion or damage to piling interlocks.

B. Pile Driving Equipment; EN.

Complete descriptions of sheet piling driving equipment including hammers, extractors, protection caps and other installation appurtenances shall be submitted for approval at least one week prior to commencement of work.

C. Materials Tests; FIO.

Certified materials tests reports showing that sheet piling and appurtenant metal materials meet the specified requirements shall be submitted for each shipment and identified with specific lots prior to installing materials. Material test reports shall meet the requirements of ASTM A 6/A 6M.

D. Pile Driving Records; FIO.

As part of the Subcontractor's quality control operations, records of the sheet piling driving operations shall be submitted after each day's driving is completed. These records will be submitted as part of the Quality Control Report for that day. These records shall provide a system of identification which shows the disposition of approved piling in the work, pile stationing and position, driving equipment performance data, piling penetration rate data, piling dimensions and top and bottom elevations of installed piling. The format for driving records shall be as approved by the FWENC Representative.

1.05 DELIVERY, STORAGE AND HANDLING

Materials delivered to the site shall be new and undamaged and shall be accompanied by certified test reports. The manufacturer's logo and mill identification mark shall be provided on the sheet piling as required by the referenced specifications. Sheet piling shall be stored and handled in the manner recommended by the manufacturer to prevent permanent deflection, distortion or damage to the interlocks. Storage of sheet piling should also facilitate required inspection activities. Sheet piling over 80 feet in length shall be handled using a minimum of two pickup points.

PART 2 PRODUCTS

2.01 METAL SHEET PILING

Metal sheet piling shall be cold-formed steel sections formed from hot-rolled steel meeting the chemical and mechanical requirements of ASTM A 572/A 572M, Grade 50, Type SZ27.

The interlocks of sheet piling shall be free-sliding, provide a swing angle suitable for the intended installation but not less than 5 degrees when interlocked, and maintain continuous interlocking when installed. Sheet piling shall be full-length sections of the dimensions shown. Fabricated sections shall conform to the requirement and the piling manufacturer's recommendations for fabricated sections. Sheet piling shall be provided with standard pulling holes.

2.02. Materials Tests

Materials tests shall conform to the following requirements. Sheet piling and appurtenant materials shall be tested and certified by the manufacturer to meet the specified chemical, mechanical and section property requirements prior to delivery to the site. Testing of sheet piling for mechanical properties shall be performed after the completion of all rolling and forming operations. Testing of sheet piling shall meet the requirements of ASTM A 6/A 6M.

PART 3 EXECUTION

3.01 INSTALLATION

A. Pile Driving Equipment

All pile driving equipment shall be designed, constructed and maintained in a manner suitable for the work to be performed in the Subcontract. If, in the opinion of the FWENC representative, the driving equipment is inadequate or deficient, it shall be removed from the job site. No increase in subcontract costs and no time extension shall be allowed for removing and replacing such equipment.

B. Driving Hammers

Hammers shall be air, or diesel drop, single-acting, double-acting, differential-acting, or vibratory type. The driving energy of the hammers shall be between 19,000 and 53,000 foot-pounds as recommended by the manufacturer for the piling weights and subsurface materials to be encountered.

C. Placing and Driving

1. Placing

Any excavation required within the area where sheet pilings are to be installed shall be completed prior to placing sheet pilings. Pilings shall be carefully located as shown. Pilings shall be placed plumb (not exceeding 1/8 inch per foot of length) and true to line. Temporary wales, templates, current deflectors or guide structures shall be provided to insure that the pilings are placed and driven to the correct alignment. Pilings properly placed and driven shall be interlocked throughout their length with adjacent pilings to form a continuous diaphragm throughout the length or run of piling wall.

2. Driving

Pilings shall be driven with the proper size hammer and by approved methods so as not to subject the pilings to damage and to ensure proper interlocking throughout their lengths. Driving hammers shall be maintained in proper alignment during driving operations by use of fixed leads or guides attached to the hammer. Caution shall be taken in the sustained use of vibratory hammers when a hard driving condition is encountered to avoid interlock-melt or damages. A protecting cap shall be employed in driving when using impact hammers to prevent damage to the tops of pilings. Pilings damaged during driving or driven out of interlock shall be removed and replaced at the pile Subcontractor's expense. Letting pilings "freefall" to aid in penetration will not be permitted. Pilings shall be driven without the aid of a water jet. Adequate precautions shall be taken to insure that pilings are driven plumb. Pilings in each run or continuous length of piling wall shall be driven alternately in increments of depth to the required depth or elevation. No piling shall be driven to a lower elevation than those behind it in the same run except when the pilings behind it cannot be driven deeper. If obstructions restrict driving a piling to the specified penetration the obstructions shall be removed or penetrated with a chisel beam. If the Subcontractor demonstrates that removal or penetration is impractical the Subcontractor shall make changes in the design alignment of the piling structure as directed to insure the adequacy and stability of the structure. Pilings shall be driven to depths shown and shall extend up to the elevation indicated for the top of pilings. A tolerance of 12 inches above the indicated top elevation will be permitted. Pilings shall not be driven within 100 feet of concrete less than 7 days old.

D. Cutting-Off and Splicing

Pilings driven to refusal or to the point where additional penetration cannot be attained and are extending above the required top elevation in excess of the specified tolerance shall be cut off to the required elevation. Piling cut-offs shall become the property of the Subcontractor and shall be removed from the site. The Subcontractor shall cut holes in pilings for bolts, rods, drains or utilities as shown or as directed. All cutting shall be done in a neat and workmanlike manner. A straight edge shall be used in cuts made by burning to avoid abrupt nicks. Bolt holes in steel piling shall be drilled or may be burned and reamed by approved methods which will not damage the surrounding metal. Holes other than bolt holes shall be reasonably smooth and the proper size for rods and other items to be inserted.

E. Inspection of Driven Piling

The Subcontractor shall inspect the interlocked joints of driven pilings extending above ground. Pilings found to be out of interlock shall be removed and replaced at the Subcontractor's expense.

F. Pulling and Redriving

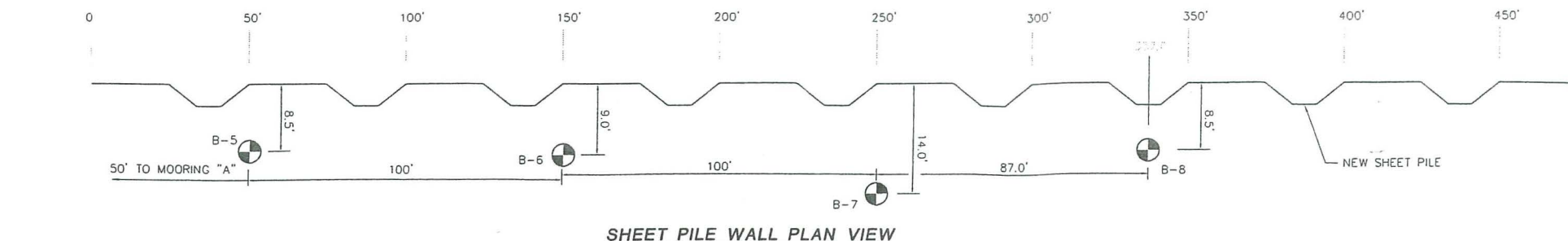
In the pulling and redriving of piles as directed, the Subcontractor shall pull selected pilings after driving to determine the condition of the underground portions of pilings. Any piling so pulled and found to be damaged to the extent that its usefulness in the structure is impaired shall be removed and replaced at the Subcontractor's expense. Pilings pulled and found to be in satisfactory condition shall be redriven when directed.

3.02 QUANTITIES

The estimated quantities of sheet piling listed in the unit price schedule of the contract as to be furnished by the Subcontractor are given for bidding purposes only. Sheet piling quantities for payment shall consist of the linear feet of piling acceptably installed. Installed quantities shall consist of all piling including fabricated sections driven between the required top and bottom elevations of pilings plus any additions thereto resulting from changes in design or alignment approved by the FWENC Representative.

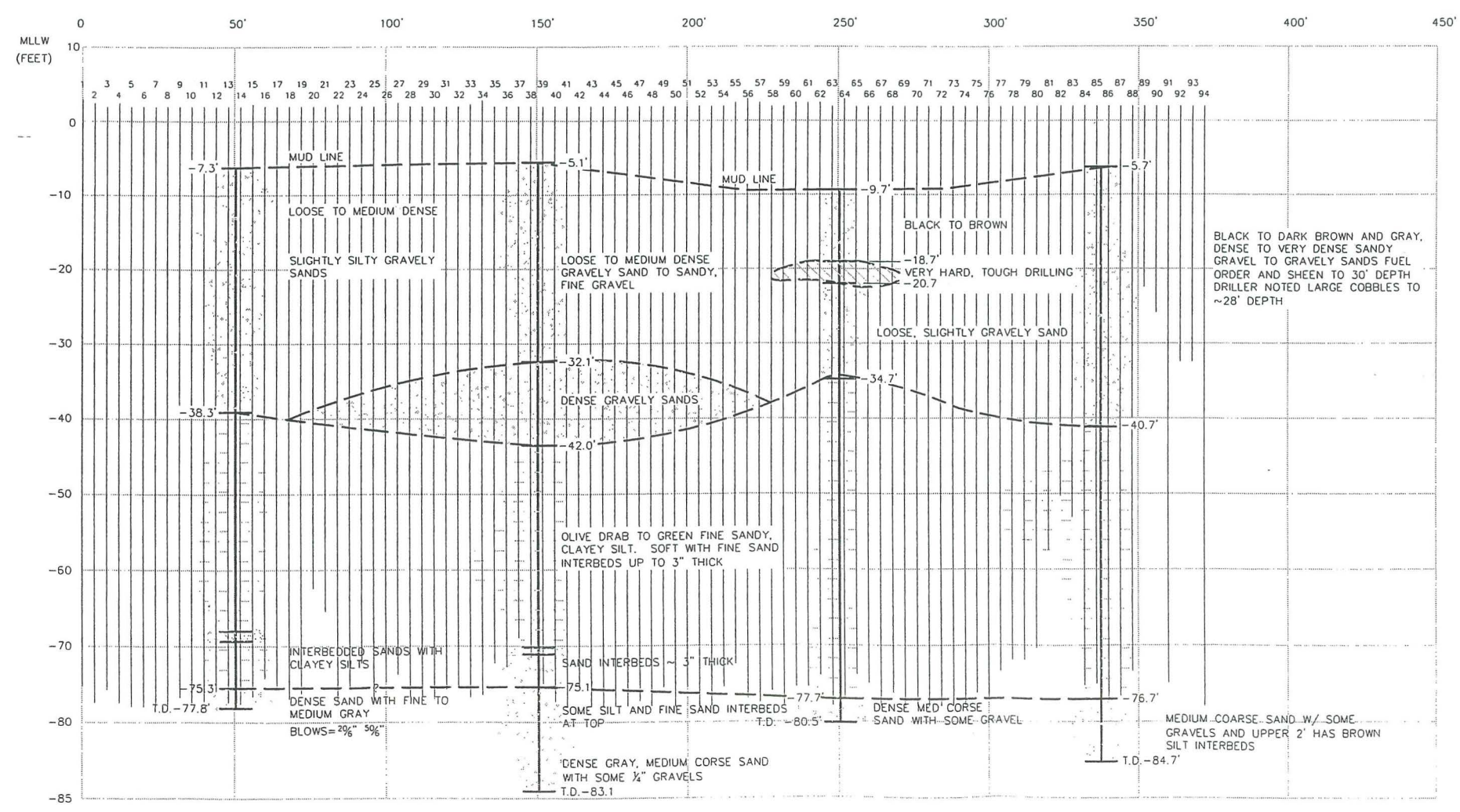
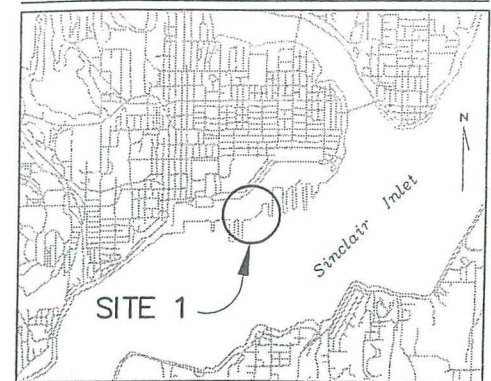
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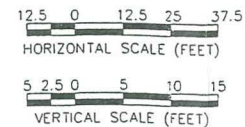
SHEET PILE WALL PLAN VIEW

SITE LOCATION MAP (NTS)



SECTION VIEW

SHEET PILE ELEVATIONS					
Sheet Pile #	Top Elevation	Tip Elevation	Sheet Pile #	Top Elevation	Tip Elevation
1	+3.0	-75.3	48	+2.0	-78.0
2	+2.5	-77.5	49	+2.0	-77.5
3	+2.0	-75.8	50	+2.0	-78.0
4	+2.5	-77.5	51	+2.0	-77.5
5	+2.0	-78.0	52	+2.0	-78.0
6	+2.0	-78.0	53	+2.0	-78.0
7	+2.0	-78.0	54	+2.0	-77.5
8	+2.0	-78.0	55	+2.5	-72.5
9	+2.0	-76.8	56	+3.0	-77.0
10	+2.0	-77.5	57	+2.5	-77.5
11	+2.0	-77.3	58	+2.0	-76.0
12	+2.0	-76.0	59	+2.0	-78.0
13	+2.0	-77.5	60	+2.5	-77.5
14	+2.0	-77.7	61	+2.5	-77.5
15	+2.3	-76.7	62	+2.5	-74.0
16	+2.0	-74.3	63	+2.0	-78.0
17	+2.0	-75.8	64	+3.0	-77.0
18	+2.0	-77.0	65	+2.0	-73.9
19	+2.0	-76.3	66	+2.0	-75.0
20	+2.0	-62.5	67	+2.0	-78.0
21	+2.0	-65.5	68	+2.0	-76.3
22	+2.3	-77.3	69	+2.0	-78.0
23	+2.0	-75.3	70	+2.0	-78.0
24	+2.0	-72.3	71	+2.0	-78.0
25	+2.0	-77.0	72	+2.0	-78.0
26	+2.5	-74.8	73	+2.0	-78.0
27	+2.5	-73.8	74	+2.0	-78.0
28	+2.0	-76.7	75	+2.0	-76.3
29	+2.0	-77.3	76	+2.0	-77.0
30	+2.0	-77.0	77	+2.0	-73.5
31	+2.0	-75.8	78	+2.0	-72.0
32	+2.0	-75.5	79	+2.0	-72.0
33	+2.3	-76.8	80	+2.0	-70.4
34	+2.8	-76.5	81	+2.0	-67.5
35	+2.0	-72.3	82	+2.0	-60.3
36	+2.0	-72.8	83	+2.0	-63.2
37	+2.0	-69.0	84	+2.0	-75.3
38	+2.0	-71.5	85	+2.0	-75.1
39	+2.0	-75.0	86	+2.0	-77.0
40	+2.0	-77.3	87	+2.0	-76.7
41	+2.0	-78.0	88	+2.0	-73.5
42	+2.0	-75.5	89	+2.0	-22.5
43	+2.0	-78.0	90	+2.0	-25.9
44	+2.0	-78.0	91	+2.0	-75.0
45	+2.0	-78.0	92	+2.0	-32.5
46	+2.0	-78.0	93	+2.0	-32.6
47	+2.0	-77.3	94	+2.0	-78.0



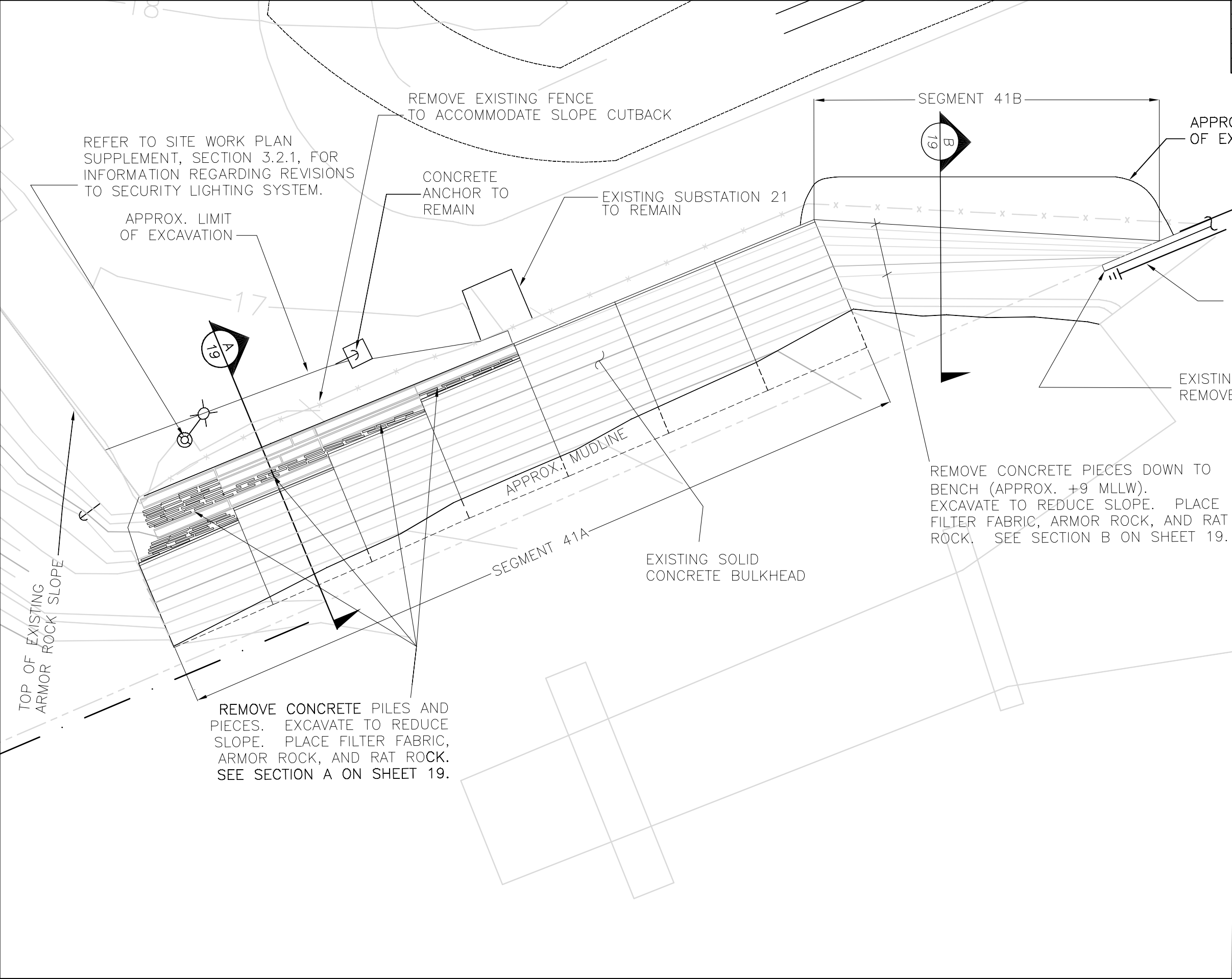
FOSTER W WHEELER
ENVIRONMENTAL CORPORATION

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON

FIGURE 2-3
GEOLOGIC CROSS-SECTIONS FROM
SOIL BORINGS AND AS-BUILT
SHEET PILE DEPTHS

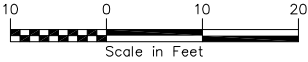
Segment 41A and 41B

NO	DATE	REVISION	BY	CH	APPROVED



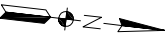
APPROVED FOR
CONSTRUCTION

DRAWING REDUCED
HALFSIZE



DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *

*Based on PSNS monument R-30 el. 17.60'



DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY, NORTHWEST
POULSBORO, WASHINGTON

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
SITE WORK PLAN
SEGMENTS 41A AND 41B
ARMOR REPAIR



TETRA TECH FW, INC.

DESIGNED: JG
DRAWN: AC
CHECKED: AB

APPROVED
LB

SIZE

D

SCALE:
AS NOTED

DRAWING NO.

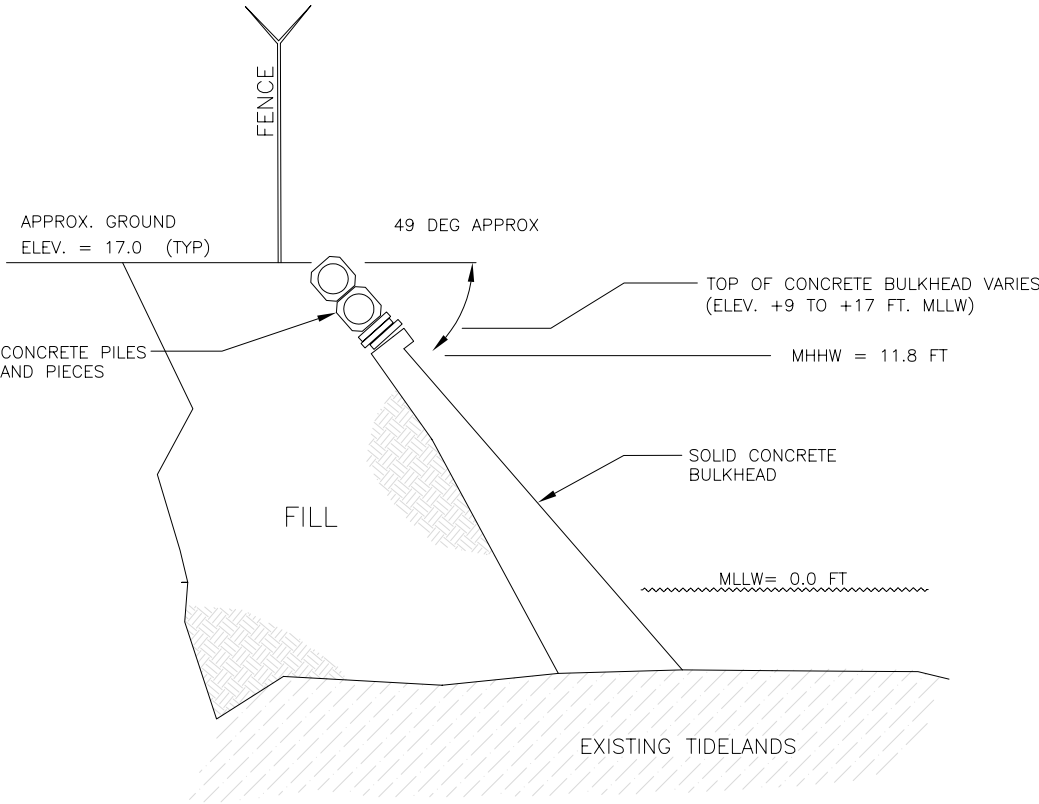
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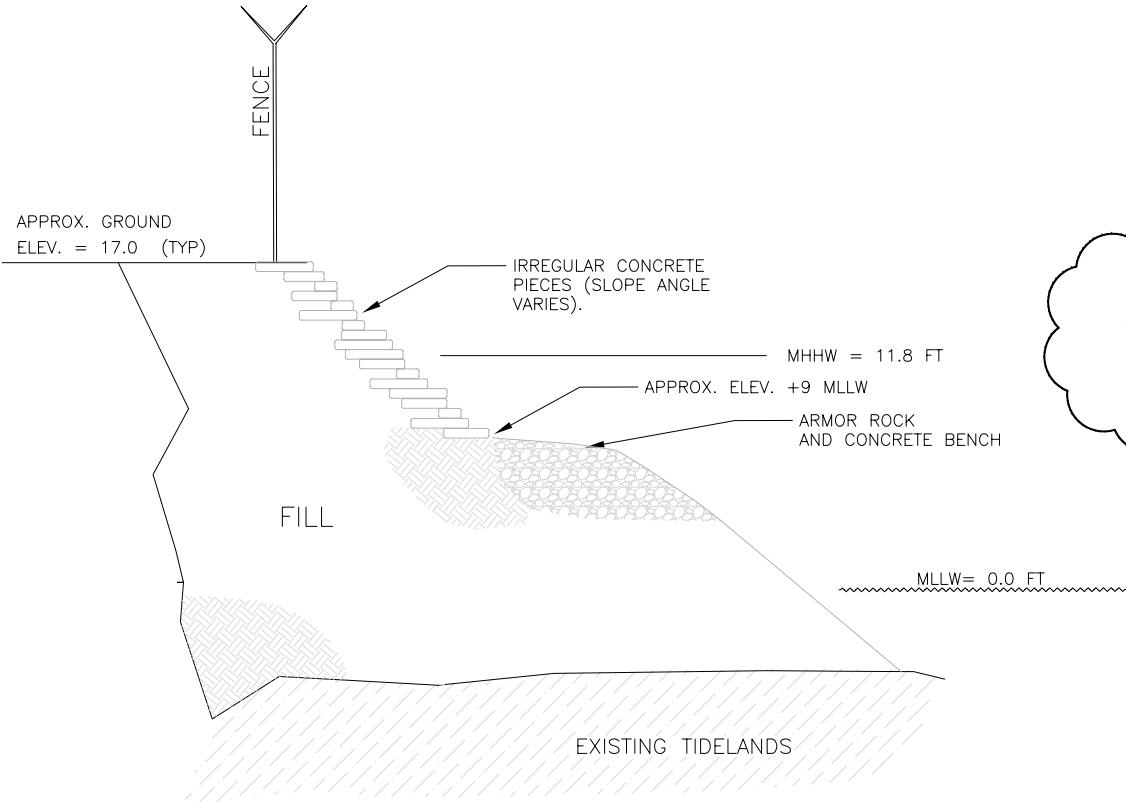
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A	7/13/05	ADD NOTE 1			

- NOTES
1. INSTALL ROW OF CONTIGUOUS 4-MAN TO 5-MAN (36" TO 54") ROCKS ALONG BASE OF NEW SLOPE. KEY IN TO THE BOTTOM OF THE ARMOR ROCK LAYER.



SECTION (BEFORE REPAIR)

A
18

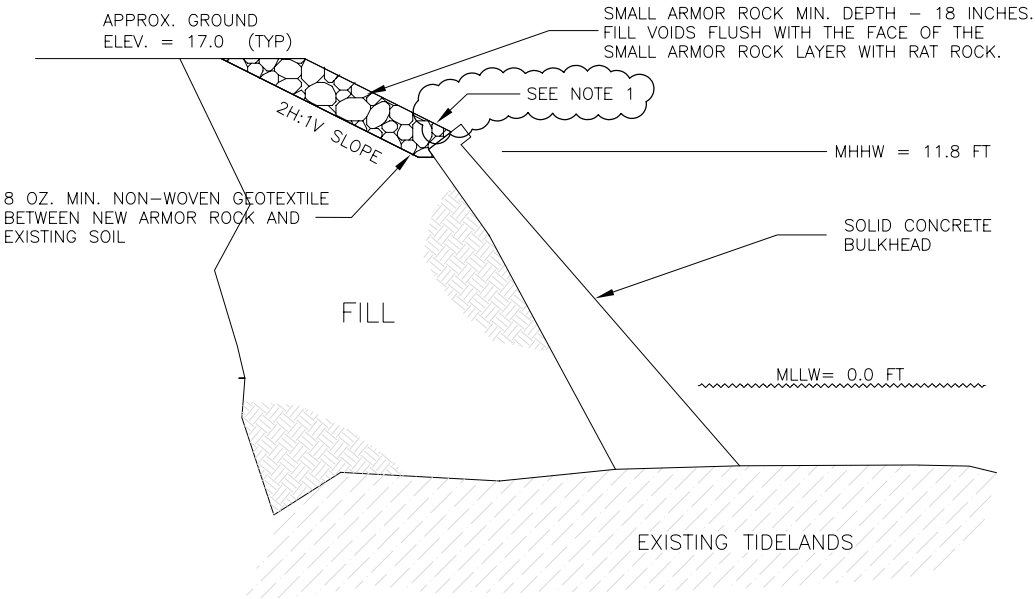


SECTION (BEFORE REPAIR)

B
18

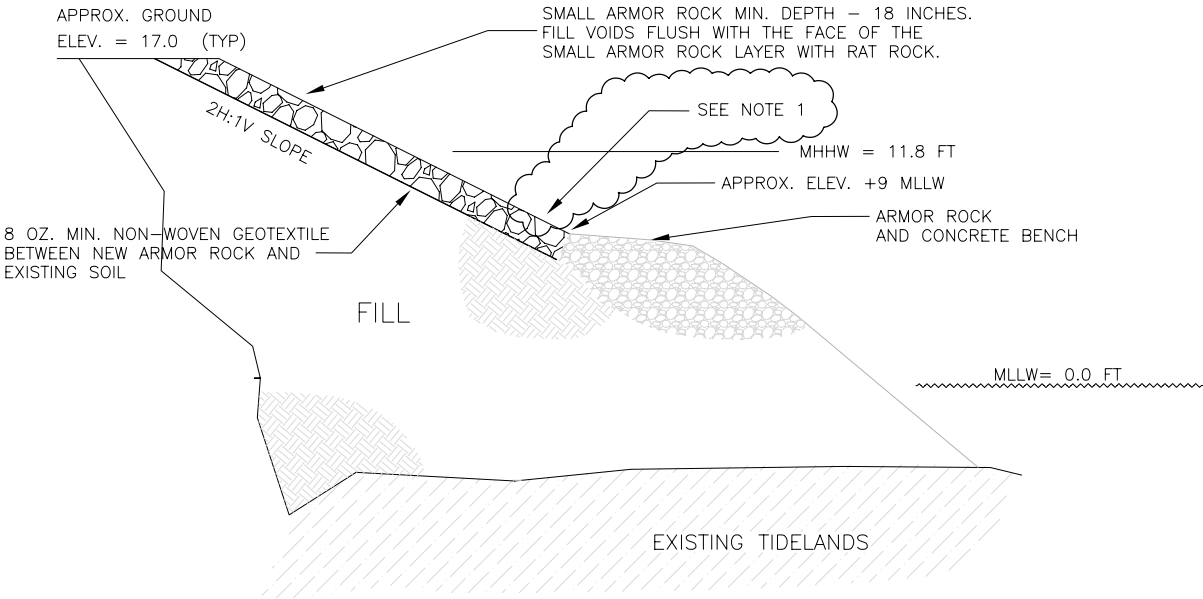
APPROVED FOR
CONSTRUCTION

DRAWING REDUCED
HALFSIZE



SECTION (AFTER REPAIR)

A
18



SECTION (AFTER REPAIR)

B
18



DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *

*Based on PSNS monument R-30 el. 17.60'

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY, NORTHWEST
POULSBORO, WASHINGTON

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
SITE WORK PLAN
SEGMENTS 41A AND 41B
TYPICAL SECTIONS

Tt TETRA TECH FW, INC.

DESIGNED: JG	APPROVED: LB	
DRAWN: AC		
CHECKED: AB		
SIZE: D	SCALE: AS NOTED	DRAWING NO. 2597-17-GL41
		19/19

Segment 42

SECTION 02480

ARMOR ROCK, FILTER, QUARRY SPALLS, AND BEACH FILL

PART 1 - GENERAL

1.01 SUMMARY

This section covers the requirements for obtaining, placing and testing armor rock, filter material, quarry spall, and beach fill materials for the upgrade of the existing seawall at the Puget Sound Naval Shipyard.

1.02 APPLICABLE PUBLICATIONS

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. American Society for Testing and Materials

ASTM-C-127 Specific Gravity and Absorption of Coarse Aggregate

B. U.S. Department of the Army, Corps of Engineers, Specifications

CRD-C-114-73 Method of Test for Soundness of Aggregates by Freezing and Thawing of Concrete Specimens

CRD-C-148-69 Method of Testing Stone for Expansive Breakdown on Soaking in Ethylene Glycol

1.03 RELATED SECTIONS

Section 01010 - Summary of Work

Section 02410 - Erosion and Sediment Control

1.04 SUBMITTALS

- A. Provide a transportation and placement plan for the armor rock, quarry spalls, filter layer, and beach fill including equipment; schedule; methods of placement; material quality control; and stockpiling. Provide a plan describing the method of grade control with regard to constructing the sea wall upgrade as shown on the drawings.
- B. Provide a Spill Prevention Control and Countermeasures Plan meeting requirements of Section 02410 including PSNS requirements (PSNS requirements will be provided separately).

C. Provide an erosion, turbidity, and sedimentation control plan.

The above plans or plan (if combined into a single document) will be reviewed by the Site Superintendent and the delivery order manager. Comments will be provided for resolution and incorporation. One review cycle is anticipated.

1.05 PROJECT MEETINGS

The Sea Wall Upgrade Subcontractor will attend the following meetings: kickoff meeting (1 meeting), project plan review meeting (1 meeting), preconstruction meeting (1 meeting), and 1 miscellaneous meeting. Any and all additional meetings are included in the performance of the work (such as participation in site QC meetings).

1.06 CONSTRUCTION FACILITIES

For material barged to the site, navigation aids and lights for all marine equipment or facilities shall be installed and maintained as required by and in a manner satisfactory to the U.S. Coast Guard and PSNS.

PART 2 - PRODUCTS

A. MATERIAL SOURCES

Armor rock, filter material, quarry spalls, and beach fill shall be select materials from an existing commercial source which meet the requirements specified below.

B. ARMOR ROCK, FILTER MATERIAL, AND QUARRY SPALLS

2.01 GENERAL

All rock shall be sound, clean, angular, durable stone. The longest dimension of any stone shall not exceed three times its shortest dimension. Acceptability of stones will be determined by laboratory tests, as hereinafter specified, geologic examination, and service records.

Armor rock, filter material, and quarry spalls, when loaded at the quarry shall be reasonably free from dirt, quarry fines or other fine materials as determined by the Site Superintendent or his designee. Any load which the Site Superintendent or his designee judges to contain excessive fine material and/or "punky" rock, shall be rejected and removed from the project at the Subcontractor's expense.

The Site Superintendent or his designee shall be allowed access to rock source(s) at any time during the duration of this project to examine the rock face and/or rock stockpile prior to and/or during load out. The Site Superintendent or his designee shall be allowed to conduct conformational testing, conduct inspections, and/or to observe operations associated with the project in order to ensure the quality of rock delivered to the site.

2.02 EVALUATION TESTING

The Subcontractor shall submit to the Senior Project Engineer or his designee all pertinent rock supplied test results and service records from his proposed source. These test results can be historical (1 to 3 years old); however, they shall include recent (less than 9 months old) data including specific gravity, absorption, accelerated expansion, and freezing and thawing. The tests shall be performed in accordance with, and meet the requirements of paragraphs Rock Quality, Accelerated Expansion, and Freezing and Thawing specified herein. In addition, the Subcontractor shall also submit samples of the rock proposed for use which shall be selected in the presence of the Senior Project Engineer or his designee. Samples shall consist of 150 pounds of rock pieces ranging in size from 4 to 10 inches or as determined by the Senior Project Engineer or his designee. The presence of the Senior Project Engineer or his designee during selection of samples of the rock will not relieve the Rock Supplier of the responsibility to secure representative samples. Satisfactory Rock Supplier documentation of laboratory test results on rock samples will not constitute approval of all rock in the quarry and will not in any way change the Subcontractor/Rock Supplier's responsibility for obtaining and developing a satisfactory source of rock. Throughout the duration of this work, the Site Superintendent or his designee may sample and test rock at the quarry or when delivered to the worksite and proposed for use in the construction as detailed above in Section 2.01. Rock failing to meet specified requirements will be removed from the worksite by the Subcontractor at his cost.

2.03 ROCK QUALITY

Armor rock and quarry spalls delivered to and incorporated in the project shall meet the following minimum specifications and the general requirements in Section 2.02:

- | | |
|---|------------------------------------|
| (1) Specific gravity (BSSD)
ASTM-C-127 | 2.60 minimum |
| (2) Absorption
ASTM-C-127 | Not more than 3 percent |
| (3) Accelerated Expansion
(CRD-C-148) | Not more than 15 percent breakdown |
| (4) Freezing and Thawing,
100 Cycles (CRD-C-114) | Not more than 10 percent loss |

2.0.3.1 ACCELERATED EXPANSION (15 DAYS)

The test sample will be tested in accordance with Corps of Engineers Testing Procedure CRD-C-148, except as herein specified. Testing procedure for sample size in CRD-C-148 shall be modified as follows: "The test sample shall be from 4950 grams to 5050 grams of 2-inch to 1-1/2-inch sized pieces." Test results will be computed by dividing the number of pieces that breakdown by the number of pieces in the original test sample. Failure or breakdown is defined as any piece separating into two or more pieces or losing sufficient surface material to allow it to pass through the 1-1/2-inch sieve. Maximum allowable breakdown is 15 percent over a period of 15 days. Weight loss based on the original oven dry weight shall be recorded.

2.0.3.2 FREEZING AND THAWING

Test sample, consisting of 10 pounds of pieces passing the 2-inch sieve and retained on 1-1/2-inch sieve will be prepared by jaw crushing or hand chipping with all sharp edges chipped off and only pieces of approximately cubical shape used. Original dry weight of pieces selected for freeze-thaw test will be computed by determining moisture content of room-dry rock from representative surplus or undersized pieces.

$$\text{Dry weight of pieces for freeze-thaw} = \frac{\frac{\text{Weight room-dry}}{\text{MG in \%}}}{100}$$

Specimens will be immersed in water for 24 hours prior to start of test. Sample is placed in a pan approximately 15 by 9-1/2 by 1-1/4 inches and the pan filled to 1/4-inch to 1/2-inch depth with water. Sample in pan is subjected to freezing and thawing in freeze-thaw apparatus described in CRD-C-114 at the rate of 12 cycles per day, one cycle consisting of approximately 1 hour in alcohol solution at $0 \pm 2^\circ\text{F}$ and 1 hour in solution at 40 ± 2 degrees F. The pan shall be suspended to a depth of 1/2 to 1 inch in the alcohol solution. Sample will be tested for 100 cycles. At the end of 100 cycles, the sample shall be washed, dried, sieved over the 1-1/2-inch sieve, and weighed. The percent loss shall be computed based on the original dry weight.

2.0.4 ROCK GRADATION

- 2.0.4.1 Armor rock for 3-foot-thick layer shall be graded with the minimum weight of individual stones not less than 50 (approx. 0.7-foot cube) pounds and the maximum weight not greater than 1,600 pounds (approx. 2.1-foot cube). Fifty percent of the pieces shall be 400 pounds or greater (approx. 1.3-foot cube). In the outer layer of armor rock, the minimum stones shall be 400 pounds or greater.
- 2.0.4.2 Armor rock for 2-foot-thick layer shall be graded with minimum weight of individual stones not less than 20 (approx. 0.5-foot cube) pounds and the maximum not greater than 600 pounds (approx. 1.5-foot cube). Fifty percent of

the pieces shall be 150 pounds (approx. 0.97 foot) or greater. In the outer layer of armor rock, the minimum stones shall be 150 pounds or greater.

- 2.0.4.3 Filter material shall be well graded between a minimum weight of 0.2 pounds (approx. 1.3-inch cube) and a maximum weight of 10 pounds (approx. 4.76-inch cube), with 50 percent, by weight, greater than 2.5 pounds (approx. 3-inch cube).
- 2.0.4.4 Quarry spalls shall be well graded between a minimum weight of 10 pounds (approx. 4.75-inch cube) and a maximum weight of 50 pounds (approx. 0.7 foot cube), with 50 percent, by weight, greater than 15 pounds (approx. 5.5 inch cube).
- 2.0.4.5 Voids in the armor rock between elevation +12 feet (msl) and elevation -17 feet (msl) shall be filled with beach fill material. The beach fill material shall be well graded and range in size from approximately 1mm to 7mm (fine/medium gravel to coarse sand) and approximated as 3/8 to 1/4 inch minus and No. 16 plus. The gradation and composition of the beach fill material shall be approved by the Site Superintendent prior to delivery and placement. *See attached 8/11/04*

2.05 ACCEPTANCE OF MATERIALS

Materials will be inspected at the jobsite prior to placement. Materials in-place which do not meet quality requirements as herein before specified will be rejected and removed from the project at the Subcontractor's expense. Materials in place which do not meet size requirements shall be removed and used where their size is appropriate or removed from the project at the Subcontractor's expense.

PART 3 - EXECUTION

3.01 PLACING OF RIPRAP ROCK MATERIALS

The intent of this work is to provide a layer of filter material and armor stone over the existing sea wall surface. Before placing the armor layer, the existing slope shall be dressed to the required line and grade using filter material. Armor rock shall be placed in a manner which will produce a close-fitting and well-keyed mass of rock with minimum percentage of voids and shall be constructed to the lines, grades, and thicknesses shown. All riprap including rock placement under water shall be placed in sections not to exceed 40 feet, perpendicular to the slope axis, after that length of slope has been dressed. The riprap shall be placed over the existing material to its full course thickness in one operation and in such a manner as to avoid displacing the underlying material. Placing the riprap by any method likely to cause segregation will not be permitted. The larger rock shall be well distributed and all the rock shall be so placed and distributed that there will be no large accumulation or area composed predominantly of either the larger or smaller pieces of rock. There shall be no loose or unkeyed rocks on the face and any unkeyed rock shall promptly be removed or repositioned. A tolerance from slope lines of minus 0.5 to plus 1 foot from top elevations and from slope lines shown on the drawings will be allowed in finished

surface, except that either extreme of this tolerance shall not be continuous over an area greater than 200 square feet.

All rock placement under water shall be accomplished by lowering rock in the conveyance bucket to the placement surface. The conveyance bucket shall then be opened.

In general, all slope protection materials shall be placed from the lower elevations to the higher elevations. Desired distribution of various sizes of stones throughout the mass shall be obtained by selective loading at quarry.

3.02 QUARRY SPALLS

Quarry spalls shall be placed to neat lines indicated on drawings. Placing of material by methods which tend to segregate particle sizes will not be permitted. A tolerance of plus 6 inches above and 0 inch below section thickness or elevations shown on drawings will be allowed in finished surface, provided extreme of this tolerance is not continuous over an area greater than 500 square feet. Any displacement of quarry spalls by waves or tidal action shall be repaired prior to placement of armor rock.

3.03 SEQUENCE OF WORK

In any given increment of shoreline protection, selective removal of existing material if required, and construction of the shoreline protection shall be carried on concurrently.

3.04 EQUIPMENT

Equipment shall be capable of placing armor rock, quarry spalls, filter, and beach fill in a manner that will provide a well profiled and keyed mass without damage to rock and shall have capability to place materials to the lines, grades, and slopes shown on the drawings.

3.05 ROAD, UTILITIES, AND PROPERTY MAINTENANCE AND RESTRICTIONS

The Site Superintendent, in advance of any work performance, shall contact the proper city, county, state, and Federal agencies for load, width, time, and use restrictions for streets and roads. Roads shall be kept in good repair during hauling operations and shall be left in good repair when work is completed.

END OF SECTION

Specification Revision

Specification 02480

Replace 2.0.4.5 with the following:

Beachfill Material

Two gradations of beachfill materials are to be used, Beach Fill Type 1 and Beach Fill Type 2.

Beach Fill Type 1:

The void spaces within the armor stone between elevation -12 msl and +9 msl, are to be filled to within 6" (+2") of the top of the armor stone with Beach Fill Type 1. This is to be done along the entire length of the upgraded seawall. Beach Fill Type 1 is a 3" minus cobble and shall meet the following specification;

<u>Sieve Size</u>	<u>Percent Passing</u>	<u>Percent Retained</u>
3"	100	0
1.5"	75 to 80	20 to 25
1"	25 to 60	40 to 75
0.5"	10 to 50	50 to 90
3/8"	10 to 20	80 to 90

Approximate quantity of 3" minus cobble mix = 4,400 tons

The material is to be placed by lowering the conveyance bucket to the top of the armor layer and then opening the bucket. Material sloughing off and rolling down the slope must be minimized.

Beach Fill Type 2:

After the placement of Beach Fill Type 1 to the proper line and grade, a feeder berm of Beach Fill Type 2 would then be placed as a mound between elevations +5 msl and +9 msl and extending the length of seawall in Zone 3 (transect 21 to the end of the wall moving southwest as defined on drawing BE 206-3). This berm will be undercut during storm events and periods of high water, supplying finer grained material to the lower elevations for marine habitat. Beach Fill Type 2 is a poorly graded coarse sand and gravel and shall meet the following specification;

<u>Sieve Size</u>	<u>Percent Passing</u>
1/2"	100
3/8"	85 to 100
#4	10 to 30
#8	0 to 10
#16	0 to 5

Approximate quantity of Type 2 Beach Fill = 600 tons

Beach Fill Type 2 is to be placed after placement of Beach Fill Type 1. Beach Fill Type 2 is to be placed at a rate of approximately 24 cubic feet per lineal foot of section three shoreline. The Beach Fill Type 2 will be placed to allow the natural angle of repose of the material to define the final mound shape.

GENERAL NOTES AND DESIGN CRITERIA

- THIS PROJECT CONSISTS OF UPGRADING THE EXISTING SEA WALL BY INSTALLING A FILTER LAYER AND ARMOR ROCK COVER. THE NEW SHORELINE PROTECTION SYSTEM WILL BE SUPPORTED BY A QUARRY SPALL BASE. THE PURPOSE OF THE IMPROVEMENT TO THE EXISTING SEA WALL IS TO MINIMIZE THE EROSION OF THE UNDERLYING FILL MATERIAL. THE PROJECT INCLUDES A BEACH FILL PLACED OVER THE ARMOR ROCK PORTION OF THE SHORELINE PROTECTION SYSTEM. THE PROJECT ALSO INVOLVES THE REHABILITATION OF THE EXISTING PARKING LOT TO MINIMIZE INFILTRATION OF PRECIPITATION THROUGH THE EXISTING ASPHALT CONCRETE PAVEMENT AS WELL AS SITE VEGETATIVE AND DRAINAGE SYSTEM ENHANCEMENTS.
- EXISTING SITE TOPOGRAPHY WAS ESTABLISHED FROM A LAND SURVEY PERFORMED BY POLARIS ENGINEERING & SURVEYING INC. AND BATHYMETRIC SURVEY PERFORMED BY BLUE WATER ENGINEERING. EXISTING SHORELINE (APPROX. 1400 FT LONG) WAS DIVIDED INTO 29 TRANSECTS AT AN APPROXIMATE SPACING OF 50 FT. ON CENTER AS WELL AS 8 SPECIAL TRANSECTS FOR THE BATHYMETRIC SURVEY.
- EXISTING SITE CONDITIONS INCLUDING INFORMATION ABOUT MATERIALS USED IN THE EXISTING CONSTRUCTION WERE PREPARED BY MERGING DATA FROM TOPOGRAPHIC AND BATHYMETRIC SURVEYS AND AUGMENTING THE MERGED DATA WITH THE ADDITIONAL INFORMATION OBTAINED FROM A FIELD TRIP DURING LOW TIDE (EL -8 FT MSL). A PHOTOGRAPHIC RECORD OF EXISTING SITE CONDITIONS IS SHOWN ON DRAWINGS BE 206-26 THROUGH BE 206-40 DATED 10/7/97 AS REVISION A.
- A VARIETY OF MATERIALS SUCH AS MEDIUM TO LARGE RIPRAP, BROKEN AND LARGE CONCRETE DEBRIS, SMALL RIPRAP, METAL DEBRIS, WOOD DEBRIS HAVE BEEN USED FOR THE EXISTING SEA WALL LEAVING UNDERLYING MATERIAL EXPOSED AT SEVERAL LOCATIONS. THE EXISTING 1400 LINEAL FOOT SEA WALL CAN BE DIVIDED INTO THE FOLLOWING FIVE DISTINCT AREAS AS A FUNCTION OF THE MOST PREVALENT MATERIAL USED IN CONSTRUCTION OF THE EXISTING SEA WALL:
 AREA 1: MEDIUM TO LARGE RIPRAP BETWEEN TRANSECTS 1 - 5
 AREA 2: LARGE CONCRETE DEBRIS BETWEEN TRANSECTS 5 - 14
 AREA 3: SMALL RIPRAP MIXED IN WITH CONCRETE DEBRIS BETWEEN TRANSECTS 14 - 20
 AREA 4: SMALL RIPRAP MIXED IN WITH MEDIUM RIPRAP BETWEEN TRANSECTS 20 - 24
 AREA 5: SMALL RIPRAP MIXED IN WITH CONCRETE DEBRIS BETWEEN TRANSECTS 24 - 29
 THE AREAS DESIGNATED ABOVE ARE USED ONLY TO DELINEATE THE EXISTING SURFACE CONDITIONS. FOR CONSTRUCTION PURPOSES THE SITE IS DIVIDED INTO ZONES.
- PORTIONS IMMEDIATELY ADJACENT TO T06 WILL BE MODIFIED BY CITY OF BREMERTON AS A PART OF STORM WATER OUTFALL CONSTRUCTION. THIS WORK WILL BE COMPLETED PRIOR TO THE CONSTRUCTION OF THE NEW SHORELINE PROTECTION SYSTEM.
- PROPOSED SHORELINE PROTECTION SYSTEM IS DESIGNED FOR WAVES GENERATED BY A 25 YEAR WIND STORM. WATER LEVELS USED IN THE WIND AND WAVE STUDY ARE AS FOLLOWS:
 EXTREME HIGH WATER (EHW) EL 8.35 MSL (EL 14.7 MLLW)
 MEAN HIGHER HIGH WATER (MHHW) EL 5.35 MSL (EL 11.7 MLLW)
 MEAN HIGH WATER (MHW) EL 4.45 MSL (EL 10.5 MLLW)
 MEAN SEA LEVEL (MSL) EL 0.0 MSL (EL 6.35 MLLW)
 MEAN LOW WATER (MLW) EL -3.55 MSL (EL 2.8 MLLW)
 MEAN LOWER LOW WATER (MLLW) EL -6.35 MSL (EL 0 MLLW)
 EXTREME LOW WATER (ELW) EL -10.85 MSL (EL -4.50 MLLW)
- RESULTS OF THE WIND AND WAVE STUDY FOR THE 25 YEAR STORM FOR VARIOUS SLOPES ARE AS FOLLOWS:

SLOPE	1.75H:1V	2H:1V	2.5H:1V	3H:1V	3.5H:1V	4H:1V
WAVE HEIGHT	3.8 FT	3.8 FT	3.8 FT	3.8 FT	3.8 FT	3.8 FT
RUN-UP	6.5 FT	6 FT	5.2 FT	4.6 FT	4.1 FT	3.7 FT
CREST ELEVATION	11.8 FT	11.3 FT	10.5 FT	9.9 FT	9.4 FT	9.0 FT
BOTTOM ELEVATION	-16.5 FT	-16.5 FT	-16.5 FT	-16.5 FT	-16.5 FT	-16.5 FT
- EXCAVATION OF THE EXISTING SEA WALL IS EXCLUDED FROM THE SELECTED REMEDY TO AVOID DISTURBANCE TO THE EXISTING CONTAMINATED FILL AND TO PROTECT BANK STABILITY.
- ALL TOPOGRAPHIC INFORMATION IN MSL UNLESS NOTED OTHERWISE. MSL + 6.35 = MLLW.

LEGEND

×	131.8	SPOT ELEVATION
⊗	211.2	GRADING PLAN SPOT ELEVATION
—150—		EXISTING INDEX CONTOUR
—150—		EXISTING INTERMEDIATE CONTOUR
—150—		NEW INDEX CONTOUR
—150—		NEW INTERMEDIATE CONTOUR
—+—+—		FENCE
—+—+—		CHECK DAM
—+—+—		SILT FENCE
—+—+— (TOP)		FILL EMBANKMENT
—+—+— (TOP)		CUT EMBANKMENT
—+—+—		ORIGINAL INFILTRATION BARRIER
—+—+— SD —+—+—		STORM DRAIN
—+—+— T&E —+—+—		TELEPHONE AND ELECTRIC LINE
—+—+— W —+—+—		WATER
—+—+—		SWALE, DITCH
2 1 2:1		SLOPE (HORIZ TO VERT)
—+—+—		DIRECTION OF FLOW
⊙		EXISTING UTILITY POLE
⊙		MONITORING WELL
●		SEALED WELL
⊙		EXISTING MANHOLE
⊙		PROPOSED MANHOLE

SYMBOLS

SECTION CUT ON SHEET 18 AND SHOWN ON SHEET 18	SECTION LETTER
SECTION CUT APPEARS ON SAME SHEET AS SHOWN	SECTION LETTER
SECTION CUT ON SHEET 18 AND SHOWN ON SHEET 22	SECTION LETTER
ON SHEET 22, THIS SECTION IS IDENTIFIED AS:	SHEET ON WHICH SECTION APPEARS
CATCH BASIN	SECTION LETTER
SECTION CUT ON MORE THAN ONE SHEET	SECTION LETTER
DETAILS ARE REFERENCED IN A SIMILAR MANNER EXCEPT NUMBERS ARE USED INSTEAD OF LETTERS	SECTION IS TYPICAL TO MANY SITUATIONS
REVISION IDENTIFICATION	TRANSECT
TRANSECT	TRANSECTS ARE LOCATED BY STATIONS FROM WEST TO EAST AND AT EACH STATION DEFLECTION ANGLES ARE TURNED POSITIVELY CLOCKWISE

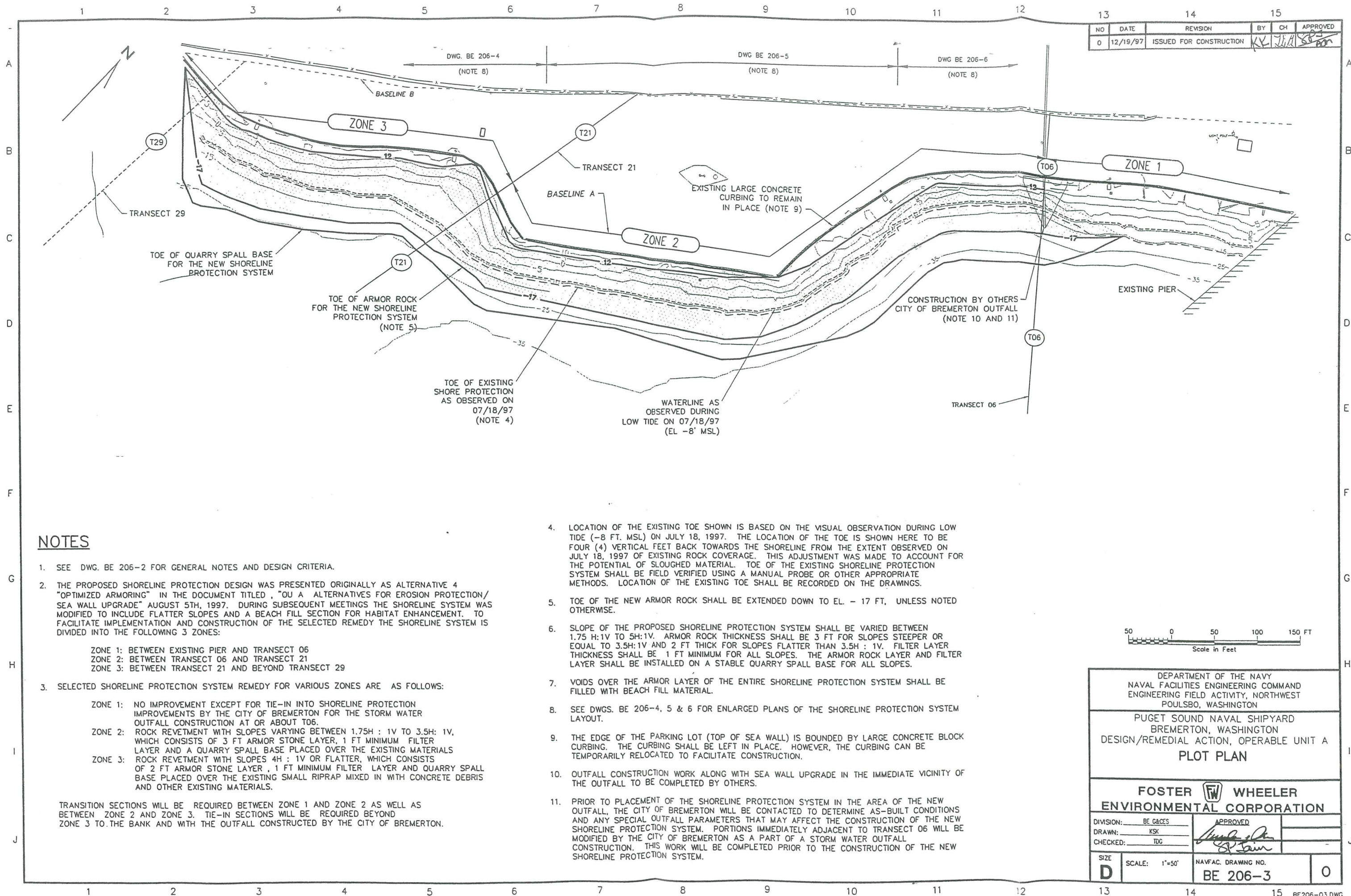
ABBREVIATIONS

CONC	CONCRETE
DIA	DIAMETER
DWG	DRAWING
E	EAST
EL, ELEV	ELEVATION
EX	EXISTING
FT	FOOT, FEET
HOR, HORIZ	HORIZONTAL
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
INV	INVERT
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MW	MONITORING WELL
N	NORTH
OD	OUTSIDE DIAMETER, OUTSIDE DIMENSION
PC	POINT OF CURVATURE-HORIZ
PT	POINT OF TANGENCY-HORIZ
PWR	POWER
R	RADIUS
RCP	REINFORCED CONCRETE PIPE
SCH	SCHEDULE
SD	STORM DRAIN
T	TANGENT LENGTH, TRANSECT
TELE	TELEPHONE
TYP	TYPICAL
UTIL	UTILITY, UTILITIES
VERT	VERTICAL
WSDOT	WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

ASPHALT PAVING	SOIL COVER, TOP SOIL	PLANTING SOIL
CONCRETE	GRAVEL	ARMOR ROCK
EXISTING PREPARED GRADED SUBBASE	LARGE RIP RAP	BUILDING
COMPACTED TOP COURSE	MEDIUM RIP RAP	FILTER LAYER
SMALL RIP RAP	CONCRETE DEBRIS	UNDISTURBED NATIVE SOIL
		QUARRY SPALL BASE

ZONE 3 SHORE PROTECTION ZONE IDENTIFIER

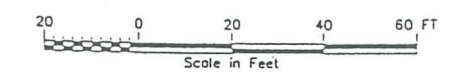
DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON			
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON DESIGN/REMEDIAL ACTION, OPERABLE UNIT A GENERAL NOTES, ABBREVIATIONS, LEGEND AND SYMBOLS			
FOSTER WHEELER ENVIRONMENTAL CORPORATION		APPROVED 	
DIVISION: BE C&CES	DRAWN: KSK	CHECKED: TDG	NAVJAC. DRAWING NO. BE 206-2
SIZE D	SCALE: NONE		0



NO	DATE	REVISION	BY	CH	APPROVED
0	12/19/97	ISSUED FOR CONSTRUCTION	KV	TEH	807

NOTES:

- SEE DRAWING BE 206-2 FOR GENERAL NOTES AND DESIGN CRITERIA.
- SEE DRAWINGS BE 206-3 FOR OVERALL SHORELINE PROTECTION SYSTEM LAYOUT.
- EXISTING SHORELINE INFORMATION SHOWN IS BASED ON TOPOGRAPHIC SURVEY BY POLARIS ENGINEERING AND SURVEYING, INC., BATHYMETRIC SURVEY BY BLUEWATER ENGINEERING, INC., AND VISUAL OBSERVATION BY FWENC ON JULY 18, 1997 WHEN THE TIDE ELEVATION WAS -8 FEET (MSL). SEE DRAWINGS BE 206-7 THRU BE 206-15 FOR ADDITIONAL DETAILS.
- TRANSECTS SHOWN IN DASHED LINES ARE FOR REFERENCE ONLY. NO SECTIONS WERE PRODUCED.
- EXISTING SHORELINE BETWEEN TRANSECTS T29 AND T24 IS PROTECTED BY SMALL TO MEDIUM SIZE RIP RAP MIXED WITH CONCRETE DEBRIS. TOE OF THE SHORELINE PROTECTION IS ESTIMATED TO EXTEND DOWN TO -12.
- EXISTING SHORELINE BETWEEN TRANSECTS T24 AND T20 IS PROTECTED BY CONCRETE DEBRIS BLOCKS. TOE OF THE SHORELINE PROTECTION IS ESTIMATED TO EXTEND DOWN TO EL -12.
- REMOVE, EXTEND AND ADJUST THE OIL/WATER SEPARATORS AND OUTFALL STRUCTURES AS NECESSARY TO ACCOMMODATE THE NEW ARMOR ROCK SECTION AS DIRECTED BY SITE SUPERINTENDENT (NOT BY SEA WALL UPGRADE SUBCONTRACTOR).
- PARKING LOT REHABILITATION WORK IS NOT SHOWN. SEE SPECIFICATION SECTIONS, ASPHALT PAVING AND SURFACING, 02510; STORM DRAINAGE SYSTEM, 02720; AND VEGETATION ENHANCEMENTS, SECTION 02805 FOR DETAILS.

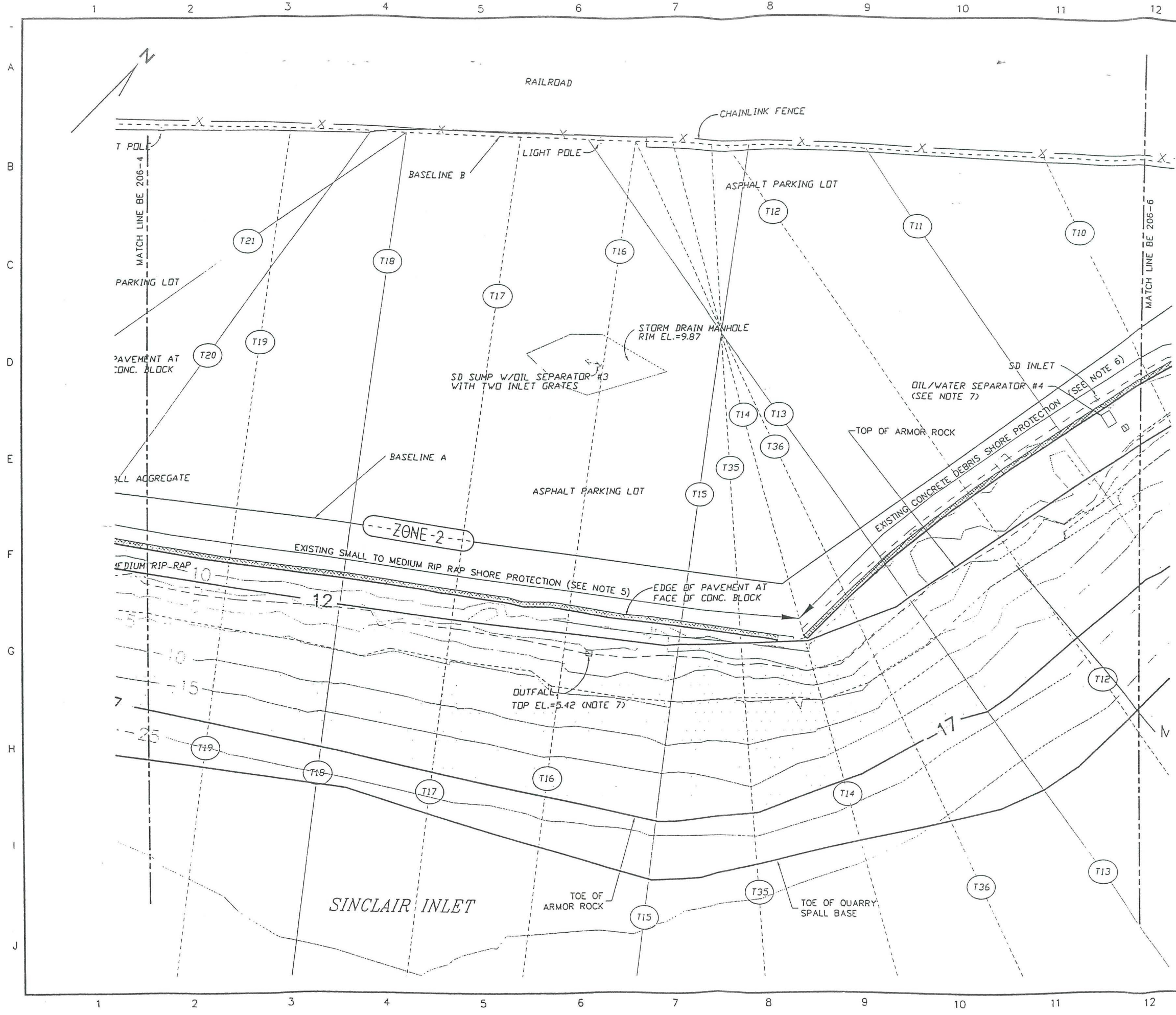


LEGEND & SYMBOLS:

- | | | | |
|--------|----------------------------------|------------|------------------|
| T13 | TRANSECT LOCATION AND IDENTIFIER | 30 | EXISTING CONTOUR |
| ZONE 3 | SHORE PROTECTION ZONE IDENTIFIER | 30 | NEW CONTOUR |
| | | ARMOR ROCK | |
| | | EX. = | EXISTING |
| | | SD = | STORM DRAIN |

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON	
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON DESIGN/REMEDIAL ACTION, OPERABLE UNIT A SHORELINE PARTIAL PLAN (SHEET 1)	
FOSTER WHEELER ENVIRONMENTAL CORPORATION	
DIVISION: BE G&ES	APPROVED:
DRAWN: KSK	CHECKED: TDG
SIZE: D	SCALE: 1" = 20'
NAVFAC. DRAWING NO. BE 206-4	0

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NO	DATE	REVISION	BY	CH	APPROVED
0	12/19/97	ISSUED FOR CONSTRUCTION	KK	7/1	SP

NOTES:

- SEE DRAWING BE 206-2 FOR GENERAL NOTES AND DESIGN CRITERIA.
- SEE DRAWINGS BE 206-3 FOR OVERALL SHORELINE PROTECTION SYSTEM LAYOUT.
- EXISTING SHORELINE INFORMATION SHOWN IS BASED ON TOPOGRAPHIC SURVEY BY POLARIS ENGINEERING AND SURVEYING, INC., BATHYMETRIC SURVEY BY BLUEWATER ENGINEERING, INC., AND VISUAL OBSERVATION BY FWENC ON JULY 18, 1997 WHEN THE TIDE ELEVATION WAS -8 FEET (MSL). SEE DRAWINGS BE 206-7 THRU BE 206-15 FOR ADDITIONAL DETAILS.
- TRANSECTS SHOWN IN DASHED LINES ARE FOR REFERENCE ONLY. NO SECTIONS WERE PRODUCED.
- EXISTING SHORELINE BETWEEN TRANSECTS T29 AND T24 IS PROTECTED BY SMALL TO MEDIUM SIZE RIP RAP MIXED WITH CONCRETE DEBRIS. TOE OF THE SHORELINE PROTECTION IS ESTIMATED TO EXTEND DOWN TO -12.
- EXISTING SHORELINE BETWEEN TRANSECTS T24 AND T20 IS PROTECTED BY CONCRETE DEBRIS BLOCKS. TOE OF THE SHORELINE PROTECTION IS ESTIMATED TO EXTEND DOWN TO EL -12.
- REMOVE, EXTEND AND ADJUST THE OIL/WATER SEPARATORS AND OUTFALL STRUCTURES AS NECESSARY TO ACCOMMODATE THE NEW ARMOR ROCK SECTION AS DIRECTED BY SITE SUPERINTENDENT (NOT BY SEA WALL UPGRADE SUBCONTRACTOR).
- PARKING LOT REHABILITATION WORK IS NOT SHOWN. SEE SPECIFICATION SECTIONS, ASPHALT PAVING AND SURFACING, 02510; STORM DRAINAGE SYSTEM, 02720; AND VEGETATION ENHANCEMENTS, SECTION 02805 FOR DETAILS.

LEGEND & SYMBOLS:

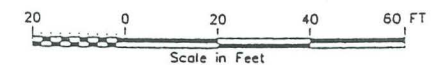
- (T09) TRANSECT LOCATION AND IDENTIFIER
- ZONE 3 SHORE PROTECTION ZONE IDENTIFIER
- EXISTING CONTOUR
- NEW CONTOUR
- ARMOR ROCK
- EX. = EXISTING
- SD = STORM DRAIN
- Scale in Feet: 0, 20, 40, 60

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON			
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON DESIGN/REMEDIAL ACTION, OPERABLE UNIT A SHORELINE PARTIAL PLAN (SHEET 2)			
FOSTER W WHEELER ENVIRONMENTAL CORPORATION			
DIVISION: BE C&CES	APPROVED		
DRAWN: K. KOCHER			
CHECKED: TDC			
SIZE D	SCALE: 1" = 20'	NAV. DRAWING NO. BE 206-5	-0

NO	DATE	REVISION	BY	CH	APPROVED
0	12/19/97	ISSUED FOR CONSTRUCTION			

NOTES:

- SEE DRAWING BE 206-2 FOR GENERAL NOTES AND DESIGN CRITERIA.
- SEE DRAWING BE 206-3 FOR OVERALL SHORELINE PROTECTION SYSTEM LAYOUT.
- EXISTING SHORELINE INFORMATION SHOWN IS BASED ON TOPOGRAPHIC SURVEY BY POLARIS ENGINEERING AND SURVEYING, INC., BATHYMETRIC SURVEY BY BLUEWATER ENGINEERING, INC., AND VISUAL OBSERVATION BY FWENC ON JULY 18, 1997 WHEN THE TIDE ELEVATION WAS -8 FEET (MSL). SEE DRAWINGS BE 206-7 THRU BE 206-15 FOR ADDITIONAL DETAILS.
- TRANSECTS SHOWN IN DASHED LINES ARE FOR REFERENCE ONLY. NO SECTIONS WERE PRODUCED.
- EXISTING SHORELINE BETWEEN TRANSECTS T14 AND T05 IS PROTECTED BY CONCRETE DEBRIS BLOCKS. TOE OF THE SHORELINE PROTECTION IS ESTIMATED TO EXTEND DOWN TO EL -12.
- EXISTING SHORELINE BETWEEN TRANSECTS T05 AND THE PIER IS PROTECTED BY CONCRETE DEBRIS BLOCKS. TOE OF THE SHORELINE PROTECTION IS ESTIMATED TO EXTEND DOWN TO EL -12.
- REMOVE, EXTEND, AND ADJUST THE OIL/WATER SEPARATORS AND OUTFALL STRUCTURES AS NECESSARY TO ACCOMMODATE THE NEW ARMOR ROCK SECTION AS DIRECTED BY SITE SUPERINTENDENT (NOT BY SEA WALL UPGRADE SUBCONTRACTOR).
- PRIOR TO PLACEMENT OF THE SHORELINE PROTECTION SYSTEM IN THE AREA OF THE NEW OUTFALL THE CITY OF BREMERTON WILL BE CONTACTED TO DETERMINE AS-BUILT CONDITIONS AND ANY SPECIAL OUTFALL PARAMETERS THAT MAY AFFECT THE CONSTRUCTION OF THE NEW SHORELINE PROTECTION SYSTEM (BY OTHERS).
- CULVERTS AND ASPHALT DITCH TO BE REMOVED AND/OR RECYCLED. DRAINAGE IMPROVEMENTS TO BE IMPLEMENTED AS PER THE SPECIFICATIONS (BY OTHERS).
- PARKING LOT REHABILITATION WORK IS NOT SHOWN. SEE SPECIFICATION SECTIONS, ASPHALT PAVING AND SURFACING, 02510; STORM DRAINAGE SYSTEM, 02720; AND VEGETATION ENHANCEMENTS, SECTION 02805 FOR DETAILS.

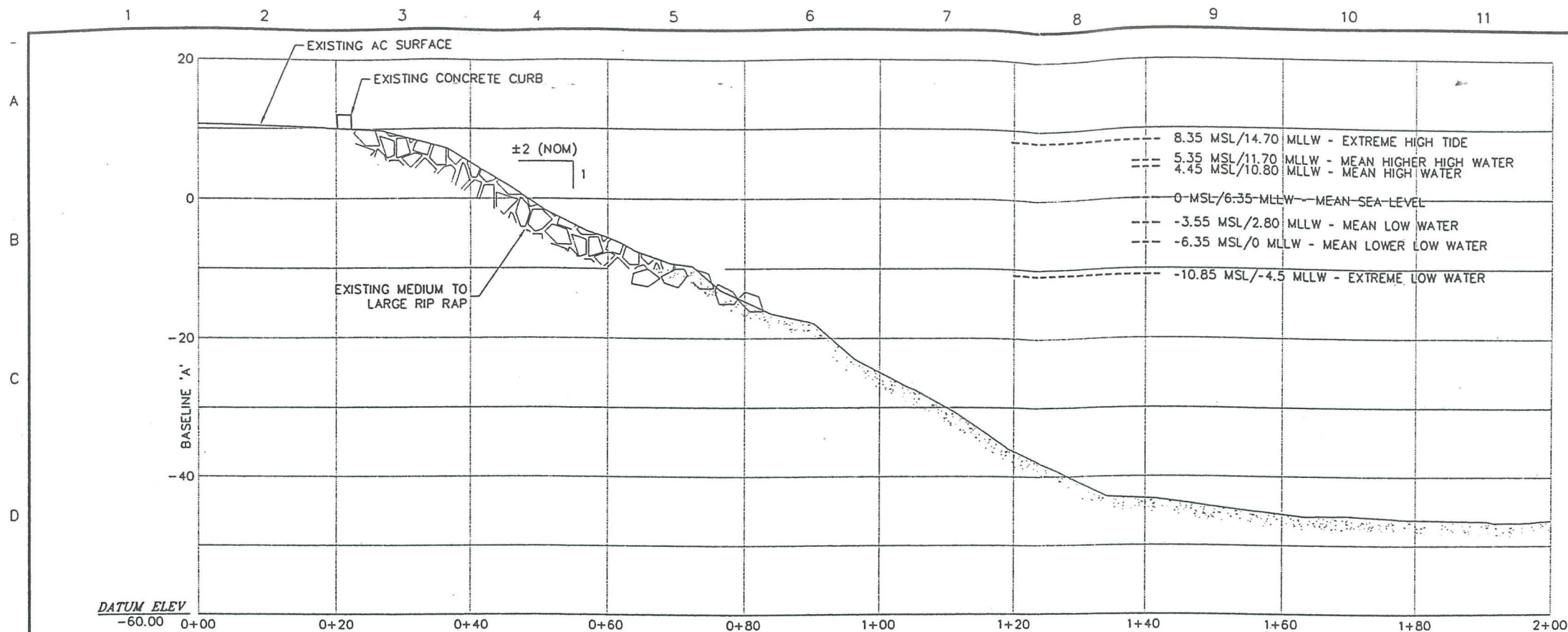


LEGEND & SYMBOLS:

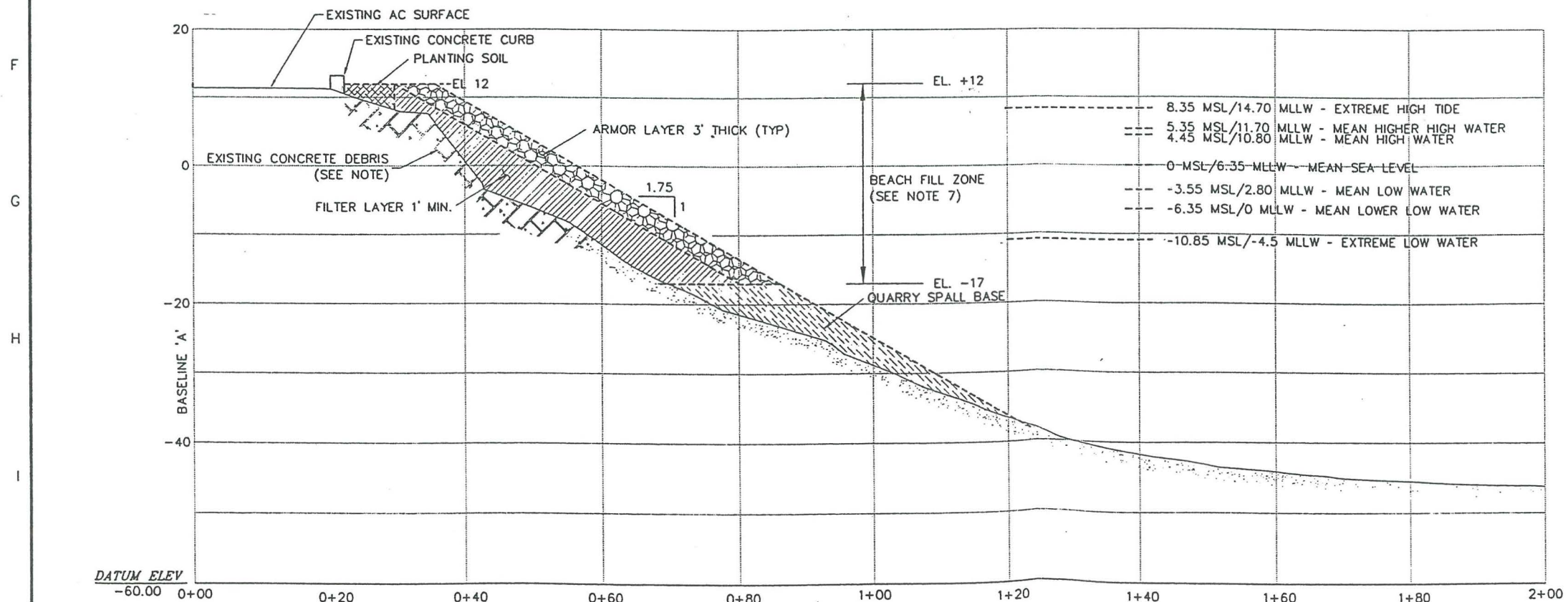
- | | | | |
|-------|----------------------------------|--|------------------|
| | TRANSECT LOCATION AND IDENTIFIER | | EXISTING CONTOUR |
| | SHORE PROTECTION ZONE IDENTIFIER | | NEW CONTOUR |
| EX. = | EXISTING | | ARMOR ROCK |
| SD = | STORM DRAIN | | |

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON	
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON DESIGN/REMEDIATION ACTION, OPERABLE UNIT A SHORELINE PARTIAL PLAN (SHEET 3)	
FOSTER WHEELER ENVIRONMENTAL CORPORATION	
DIVISION: BE C&ES	APPROVED:
DRAWN: KSK	CHECKED: TDC
SIZE: D	SCALE: 1"=20'
NAV FAC. DRAWING NO. BE 206-6	0

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TRANSECT 4 ZONE 1
SCALE - 1" = 10'

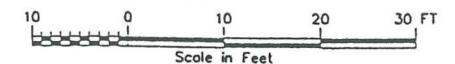


TRANSECT 6 ZONE 2
SCALE - 1" = 10'

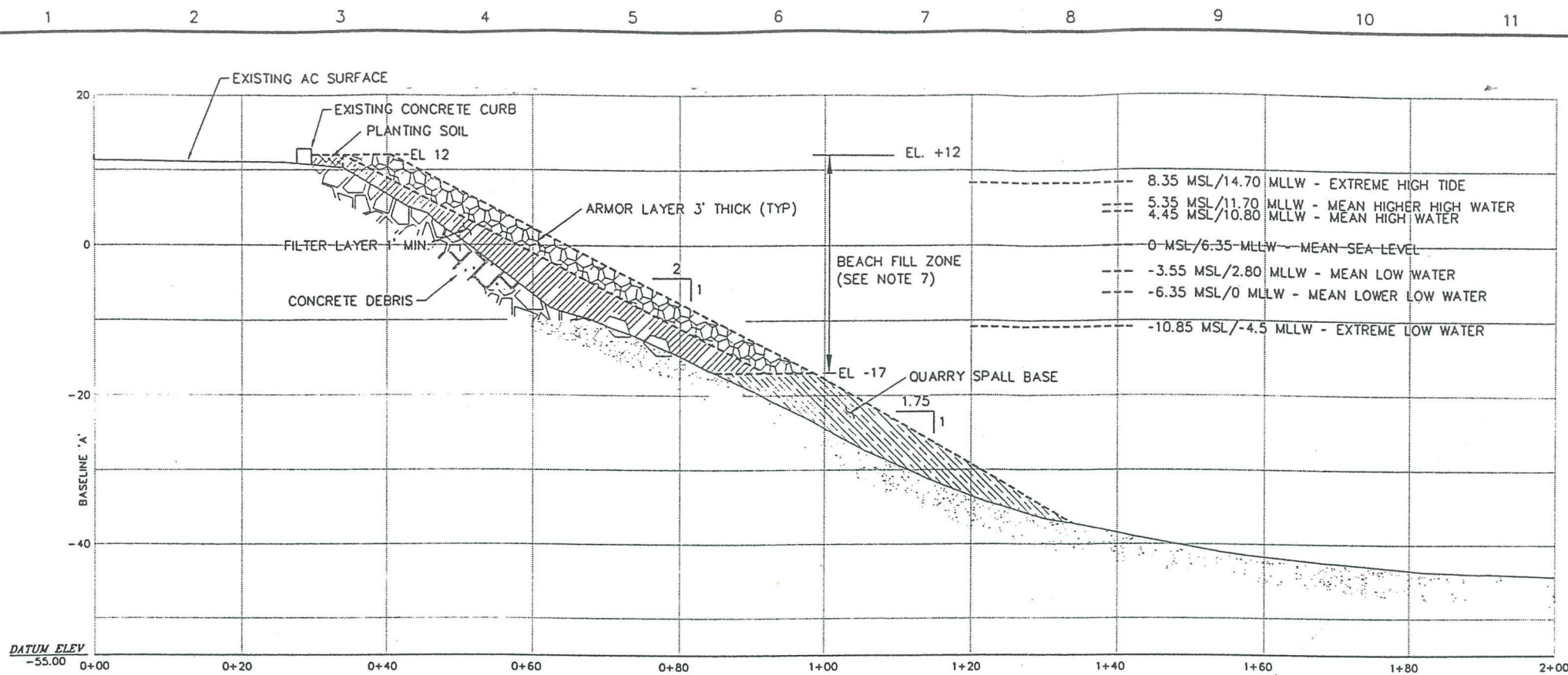
NO	DATE	REVISION	BY	CH	APPROVED
0	12/19/97	ISSUED FOR CONSTRUCTION	KK	7/1	8/1

NOTES

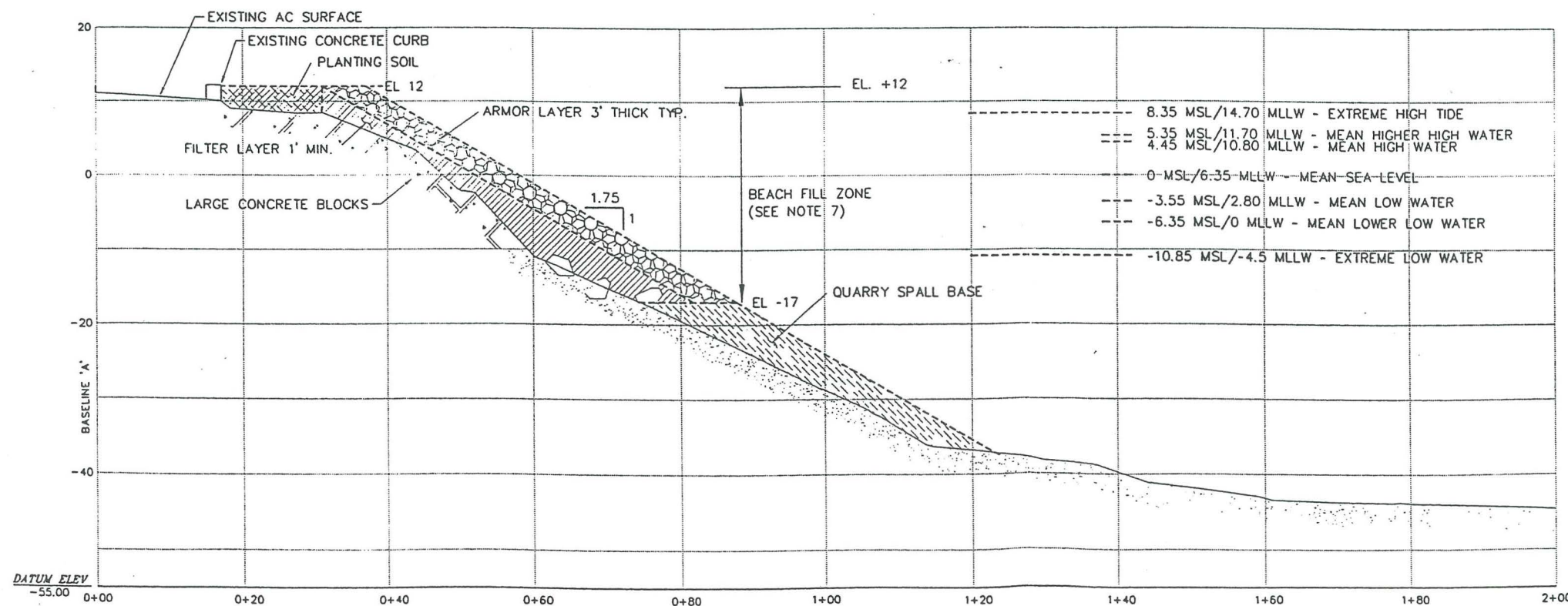
- SEE DRAWING BE 206-2 FOR GENERAL NOTES AND DESIGN CRITERIA.
- SEE DRAWING BE 206-3 FOR OVERALL SHORELINE PROTECTION SYSTEM LAYOUT AND DRAWING BE 206-3A FOR THE PROJECT GEOMETRY.
- SEE DRAWING BE 206-6 FOR LOCATION OF THE TRANSECTS.
- EXISTING SHORELINE PROTECTION IN ZONE 1 CONSISTS OF MEDIUM TO LARGER ARMOR STONE LAYER. APPROXIMATELY 30 LINEAL FEET OF THE SHORELINE PROTECTION AROUND T06 WILL BE UPGRADED BY THE CITY OF BREMERTON AS A PART OF STORMWATER OUTFALL CONSTRUCTION. NO ADDITIONAL SHORE PROTECTION IS PROPOSED IN THIS AREA EXCEPT A TIE-IN SECTION.
- TOE OF EXISTING SEA WALL IS ESTIMATED BASED ON THE VISUAL OBSERVATION DURING LOW TIDE (-8 MSL).
- EXISTING LARGE CONCRETE DEBRIS MAY BE SELECTIVELY BROKEN IN-PLACE, BROKEN AND RELOCATED, OR DISPOSED OFF-SITE TO FACILITATE ROUGH GRADING UNDER THE FILTER LAYER, MINIMIZE THICKNESS OF FILTER LAYER, TO FACILITATE FLATTER SLOPES IN T20 TO T30; AND LIMIT THE SEAWARD EXTENT OF QUARRY SPALL BASE. CONCRETE DEBRIS SHALL NOT BE REMOVED TO THE EXTENT THAT EXISTING UNDERLYING CONTAMINATED FILL MATERIAL IS EXPOSED. PLACEMENT OF DEBRIS SHALL BE APPROVED BY THE SITE SUPERINTENDENT.
- VOIDS IN THE ARMOR LAYER SHALL BE FILLED WITH BEACH FILL MATERIAL BETWEEN EL +12FT AND EL -17 FT FOR HABITAT ENHANCEMENT.
- SEE SPECIFICATION SECTION 02480 FOR THE MATERIAL REQUIREMENTS OF ARMOR LAYER, FILTER LAYER, QUARRY SPALL BASE, AND BEACH FILL.
- A SOIL PLANTING POCKET SHALL BE CONSTRUCTED AT THE TOP OF THE SHORELINE PROTECTION SYSTEM. THE POCKET SHALL HAVE AN ARMOR ROCK FACE ON THE SEAWARD SIDE. THE ARMOR ROCK SHALL EXTEND LANDWARD AND BE SUPPORTED AT A MINIMUM TO THE NATURAL ANGLE OF REPOSE OF THE ARMOR ROCK. THIS POCKET FORMED BETWEEN THE ARMOR ROCK AND CURB WILL BE BACKFILLED WITH SOIL NOT BE SEAWALL UPGRADE SUBCONTRACTOR.
- THE SITE SUPERINTENDENT WILL PROVIDE DETAILS ON THE DEPTH, WIDTH, AND POCKET LOCATION. SOIL PLANTING AND VEGETATION WILL BE PERFORMED BY OTHERS.



DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON			
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON DESIGN/REMEDIAL ACTION, OPERABLE UNIT A			
SHORELINE PLAN TRANSECTS 4, 6			
FOSTER WHEELER ENVIRONMENTAL CORPORATION			
DIVISION: BE GRCS	APPROVED:		
DRAWN: SKAMINSKI	CHECKED: TDG		
SIZE: D	SCALE: 1"=10'	NAVFAC. DRAWING NO.	0
		BE 206-7	



TRANSECT 9 ZONE 2
SCALE - 1" = 10'

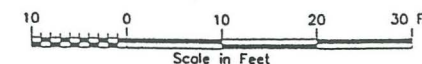


TRANSECT 11 ZONE 2
SCALE - 1" = 10'

NO	DATE	REVISION	BY	CH	APPROVED
0	12/19/97	ISSUED FOR CONSTRUCTION	KV	TH	CE

NOTES

- SEE DRAWING BE 206-2 FOR GENERAL NOTES AND DESIGN CRITERIA.
- SEE DRAWING BE 206-3 FOR OVERALL SHORELINE PROTECTION SYSTEM LAYOUT AND DRAWING BE 206-3A FOR THE PROJECT GEOMETRY.
- SEE DRAWINGS BE 206-5 AND BE 206-6 FOR LOCATION OF THE TRANSECTS.
- EXISTING SHORELINE PROTECTION IN ZONE 1 CONSISTS OF MEDIUM TO LARGER ARMOR STONE LAYER. APPROXIMATELY 30 LINEAL FEET OF THE SHORELINE PROTECTION AROUND T06 WILL BE UPGRADED BY THE CITY OF BREMERTON AS A PART OF STORMWATER OUTFALL CONSTRUCTION. NO ADDITIONAL SHORE PROTECTION IS PROPOSED IN THIS AREA EXCEPT A TIE-IN SECTION.
- TOE OF EXISTING SEA WALL IS ESTIMATED BASED ON THE VISUAL OBSERVATION DURING LOW TIDE (-8 MSL).
- EXISTING LARGE CONCRETE DEBRIS MAY BE SELECTIVELY BROKEN IN-PLACE, BROKEN AND RELOCATED, OR DISPOSED OFF-SITE TO FACILITATE ROUGH GRADING UNDER THE FILTER LAYER. MINIMIZE THICKNESS OF FILTER LAYER, TO FACILITATE FLATTER SLOPES IN T20 TO T30; AND LIMIT THE SEAWARD EXTENT OF QUARRY SPALL BASE. CONCRETE DEBRIS SHALL NOT BE REMOVED TO THE EXTENT THAT EXISTING UNDERLYING CONTAMINATED FILL MATERIAL IS EXPOSED. PLACEMENT OF DEBRIS SHALL BE APPROVED BY THE SITE SUPERINTENDENT.
- VOIDS IN THE ARMOR LAYER SHALL BE FILLED WITH BEACH FILL MATERIAL BETWEEN EL +12FT AND EL -17 FT FOR HABITAT ENHANCEMENT.
- SEE SPECIFICATION SECTION 02480 FOR THE MATERIAL REQUIREMENTS OF ARMOR LAYER, FILTER LAYER, QUARRY SPALL BASE, AND BEACH FILL.
- A SOIL PLANTING POCKET SHALL BE CONSTRUCTED AT THE TOP OF THE SHORELINE PROTECTION SYSTEM. THE POCKET SHALL HAVE AN ARMOR ROCK FACE ON THE SEAWARD SIDE. THE ARMOR ROCK SHALL EXTEND LANDWARD AND BE SUPPORTED AT A MINIMUM TO THE NATURAL ANGLE OF REPOSE OF THE ARMOR ROCK. THIS POCKET FORMED BETWEEN THE ARMOR ROCK AND CURB WILL BE BACKFILLED WITH SOIL NOT BE SEAWALL UPGRADE SUBCONTRACTOR.
- THE SITE SUPERINTENDENT WILL PROVIDE DETAILS ON THE DEPTH, WIDTH, AND POCKET LOCATION. SOIL PLANTING AND VEGETATION WILL BE PERFORMED BY OTHERS.

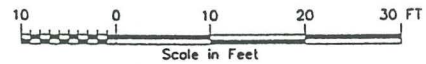


DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON			
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON DESIGN/REMEDIAL ACTION, OPERABLE UNIT A SHORELINE PLAN TRANSECTS 9, 11			
FOSTER WHEELER ENVIRONMENTAL CORPORATION			
DIVISION: BE C&ES	APPROVED		
DRAWN: SKAMINSKI			
CHECKED: TDG			
SIZE D	SCALE: 1" = 10'	NAVFAC DRAWING NO. BE 206-8	0

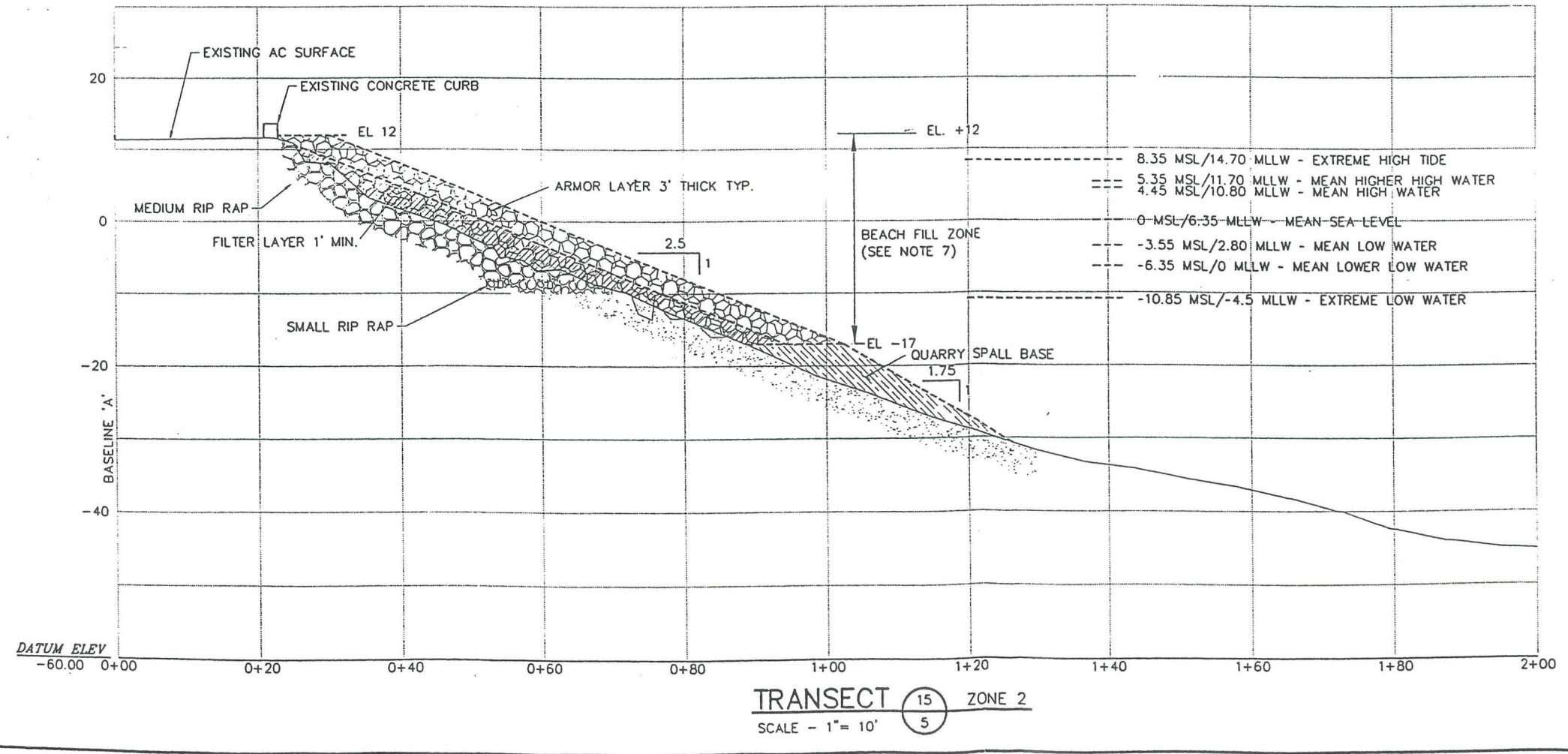
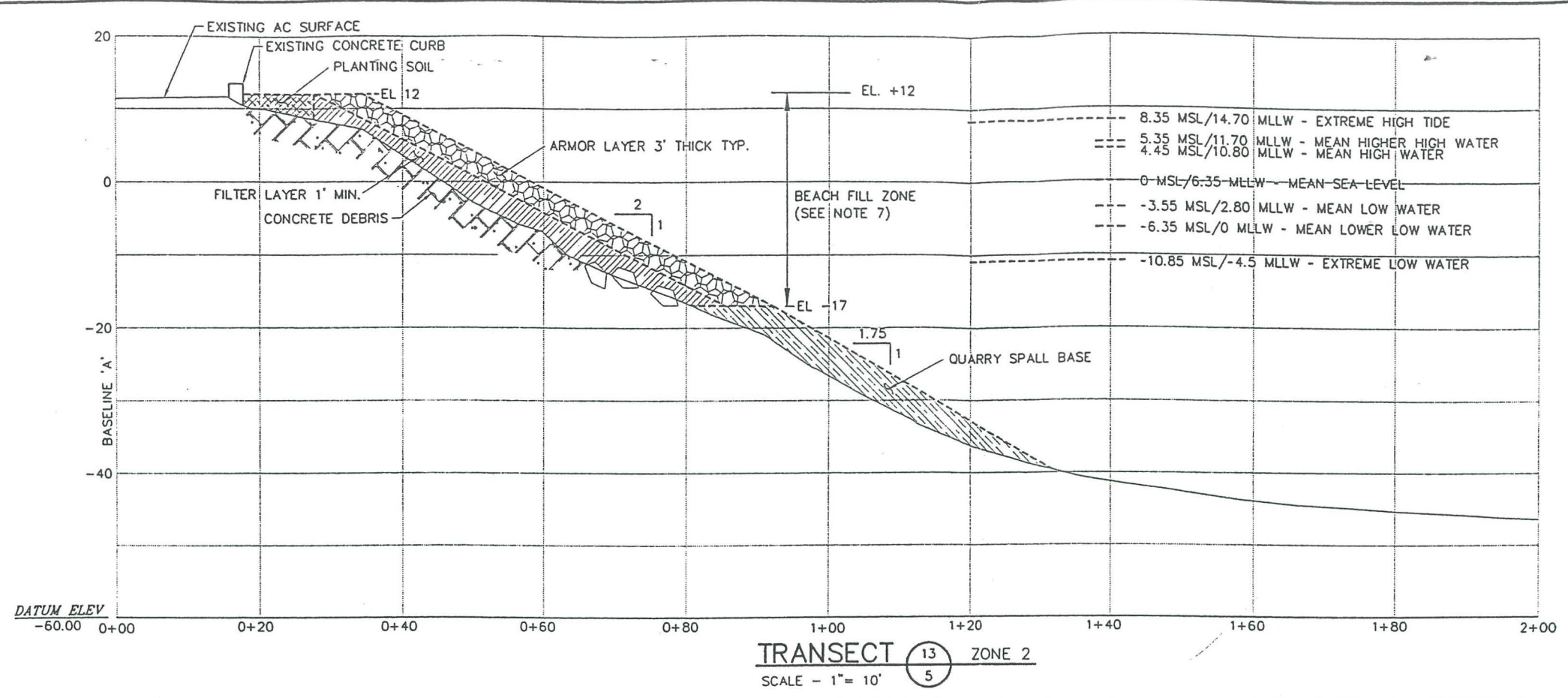
NO	DATE	REVISION	BY	CH	APPROVED
0	12/19/97	ISSUED FOR CONSTRUCTION	KK	JLH	BYC

NOTES

- SEE DRAWING BE 206-2 FOR GENERAL NOTES AND DESIGN CRITERIA.
- SEE DRAWING BE 206-3 FOR OVERALL SHORELINE PROTECTION SYSTEM LAYOUT AND DRAWING BE 206-3A FOR THE PROJECT GEOMETRY.
- SEE DRAWING BE 206-5 FOR LOCATION OF THE TRANSECTS.
- EXISTING SHORELINE PROTECTION IN ZONE 1 CONSISTS OF MEDIUM TO LARGER ARMOR STONE LAYER. APPROXIMATELY 30 LINEAL FEET OF THE SHORELINE PROTECTION AROUND T06 WILL BE UPGRADED BY THE CITY OF BREMERTON AS A PART OF STORMWATER OUTFALL CONSTRUCTION. NO ADDITIONAL SHORE PROTECTION IS PROPOSED IN THIS AREA EXCEPT A TIE-IN SECTION.
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- VOIDS IN THE ARMOR LAYER SHALL BE FILLED WITH BEACH FILL MATERIAL BETWEEN EL +12FT AND EL -17 FT FOR HABITAT ENHANCEMENT.
- SEE SPECIFICATION SECTION 02480 FOR THE MATERIAL REQUIREMENTS OF ARMOR LAYER, FILTER LAYER, QUARRY SPALL BASE, AND BEACH FILL.
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- THE SITE SUPERINTENDENT WILL PROVIDE DETAILS ON THE DEPTH, WIDTH, AND POCKET LOCATION. SOIL PLANTING AND VEGETATION WILL BE PERFORMED BY OTHERS.



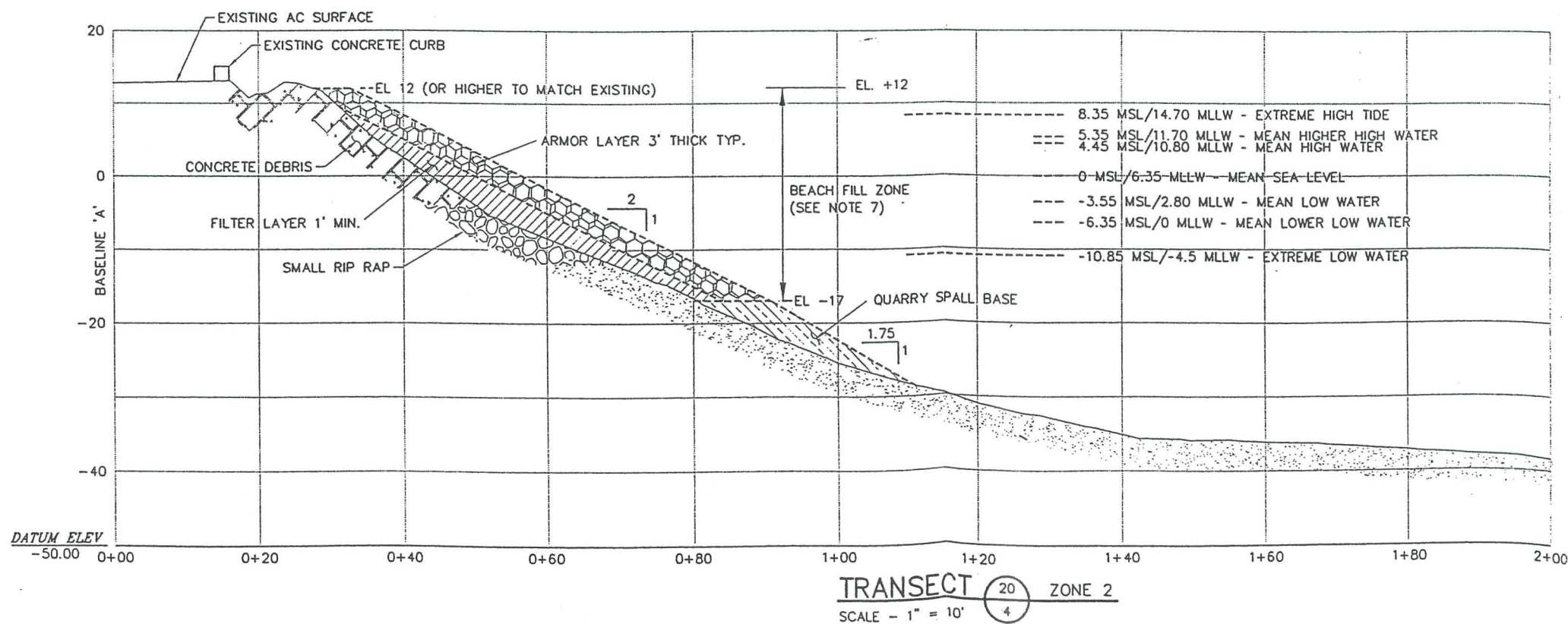
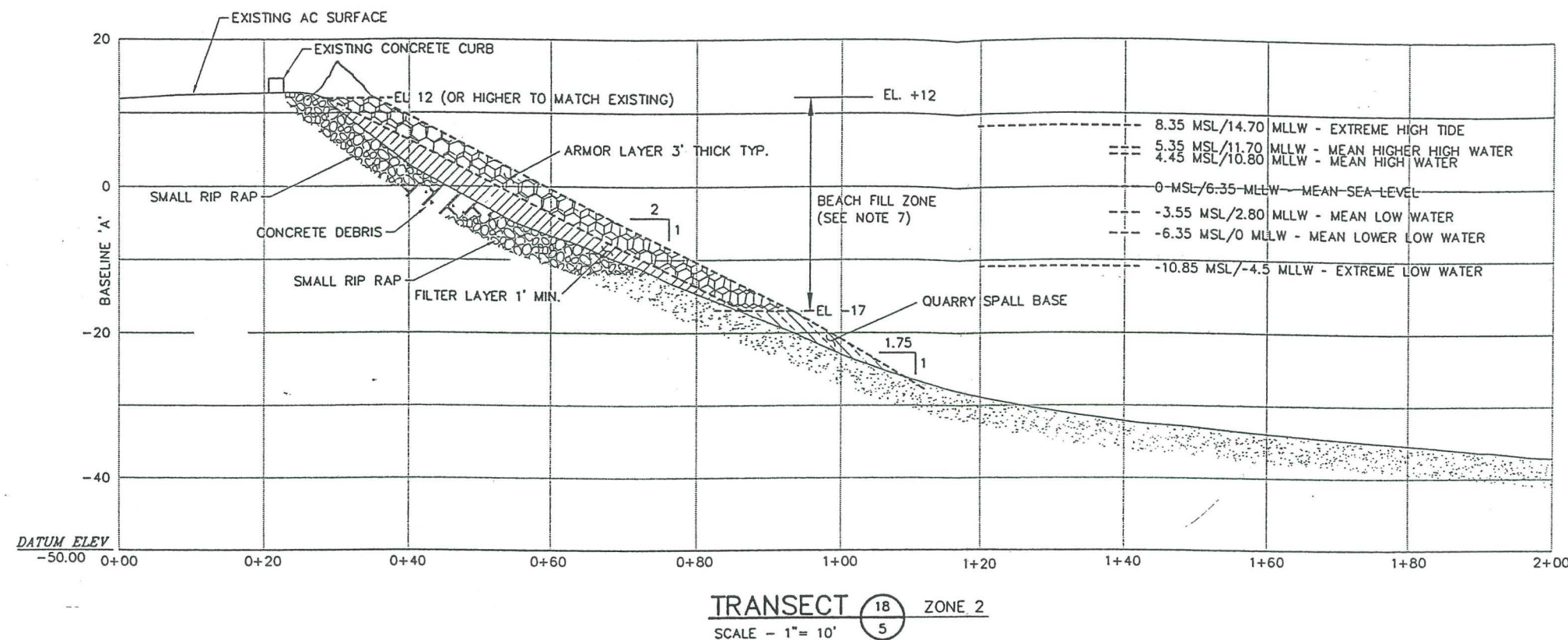
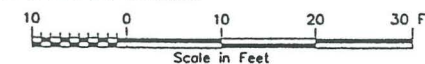
DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON	
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON DESIGN/REMEDIAL ACTION, OPERABLE UNIT A	
SHORELINE PLAN TRANSECTS 13, 15	
FOSTER WHEELER ENVIRONMENTAL CORPORATION	
DIVISION: BE GACES	APPROVED:
DRAWN: S KAMINSKI	CHECKED: TDG
SIZE: D	SCALE: 1" = 10'
NAVFAC. DRAWING NO. BE 206-9	
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0	12/19/97	ISSUED FOR CONSTRUCTION	KY	JAH	SP

NOTES

- SEE DRAWING BE 206-2 FOR GENERAL NOTES AND DESIGN CRITERIA.
- SEE DRAWING BE 206-3 FOR OVERALL SHORELINE PROTECTION SYSTEM LAYOUT AND DRAWING BE 206-3A FOR THE PROJECT GEOMETRY.
- SEE DRAWINGS BE 206-4 AND BE 206-5 FOR LOCATION OF THE TRANSECTS.
- EXISTING SHORELINE PROTECTION IN ZONE 1 CONSISTS OF MEDIUM TO LARGER ARMOR STONE LAYER. APPROXIMATELY 30 LINEAL FEET OF THE SHORELINE PROTECTION AROUND T06 WILL BE UPGRADED BY THE CITY OF BREMERTON AS A PART OF STORMWATER OUTFALL CONSTRUCTION. NO ADDITIONAL SHORE PROTECTION IS PROPOSED IN THIS AREA EXCEPT A TIE-IN SECTION.
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- SEE SPECIFICATION SECTION 02480 FOR THE MATERIAL REQUIREMENTS OF ARMOR LAYER, FILTER LAYER, QUARRY SPALL BASE, AND BEACH FILL.
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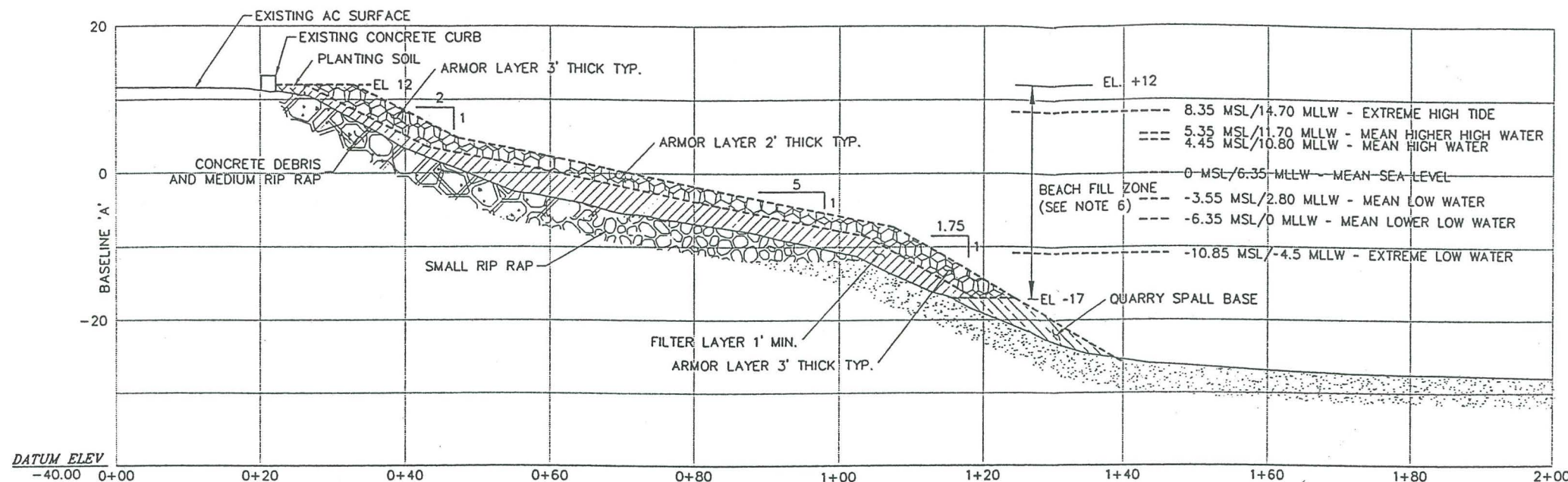


DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON			
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON DESIGN/REMEDIAL ACTION, OPERABLE UNIT A			
SHORELINE PLAN TRANSECTS 18, 20			
FOSTER WHEELER ENVIRONMENTAL CORPORATION			
DIVISION: BE CACES	APPROVED		
DRAWN: KSK			
CHECKED: TDG			
SIZE D	SCALE: 1"=10'	NAVFAC. DRAWING NO.	0
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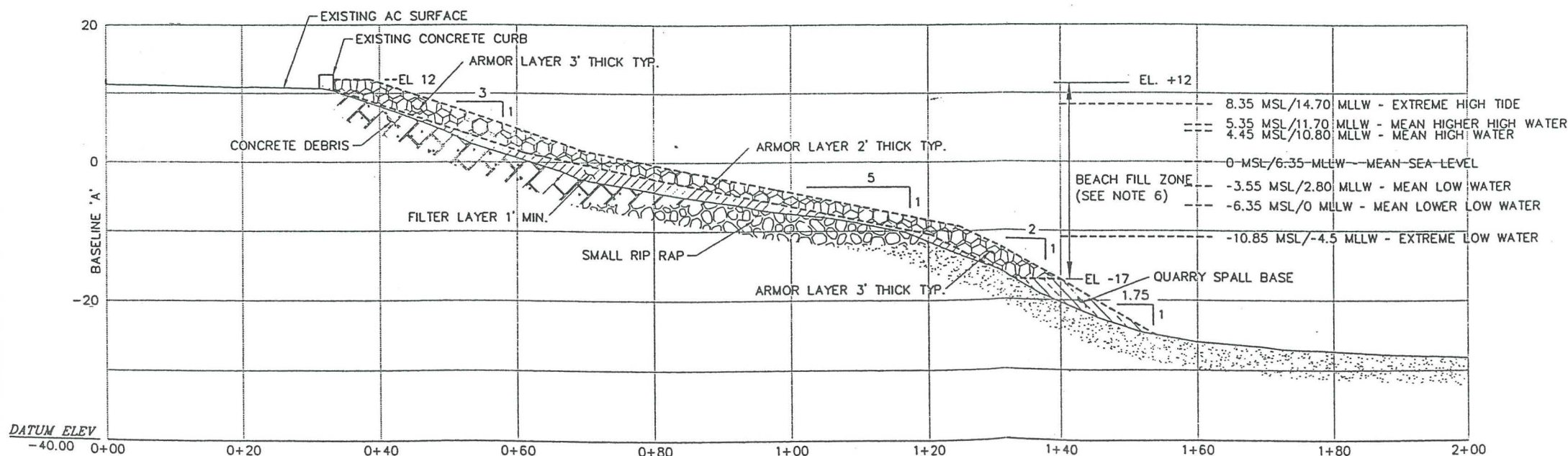
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0	12/19/97	ISSUED FOR CONSTRUCTION			

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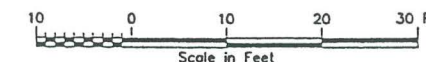
- SEE DRAWING BE 206-2 FOR GENERAL NOTES AND DESIGN CRITERIA.
- SEE DRAWING BE 206-3 FOR OVERALL SHORELINE PROTECTION SYSTEM LAYOUT AND DRAWING BE 206-3A FOR THE PROJECT GEOMETRY.
- SEE DRAWING BE 206-4 FOR LOCATION OF THE TRANSECTS.
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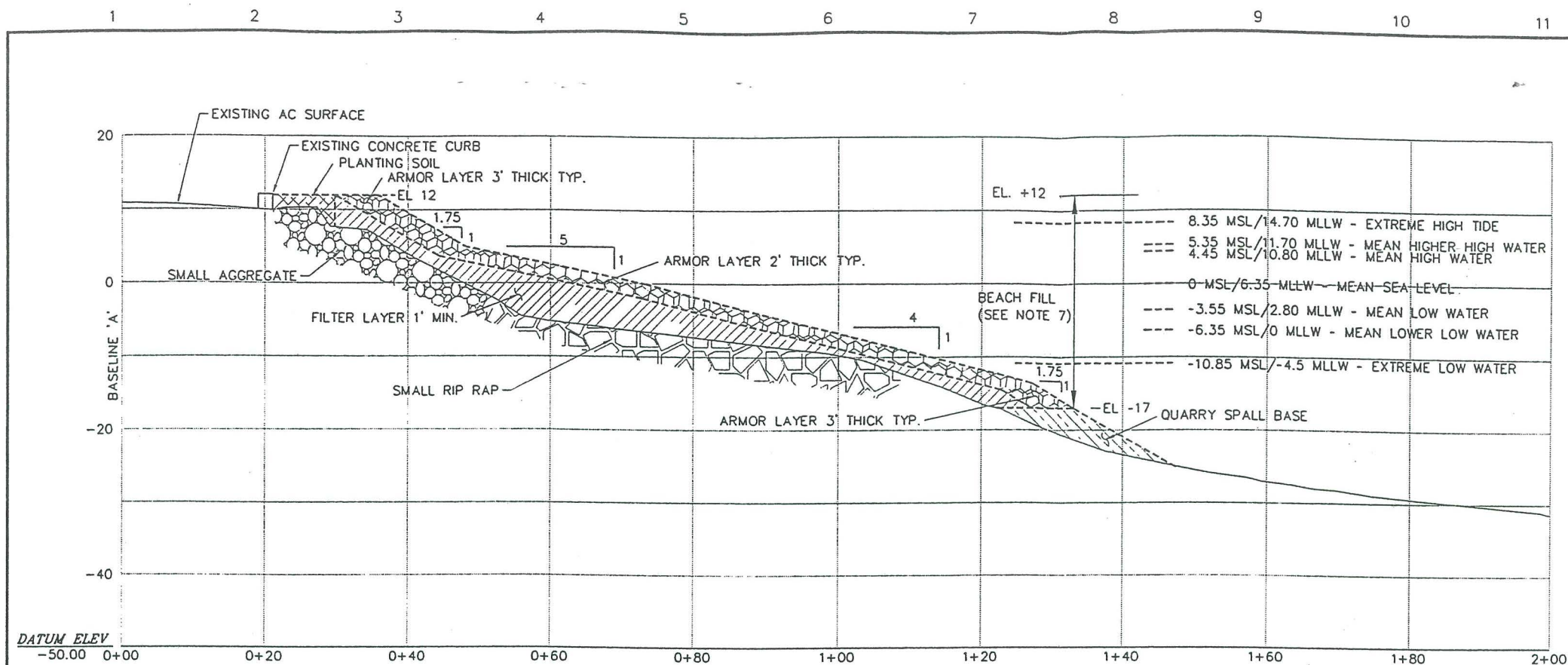
TRANSECT 21 ZONE 3
SCALE - 1" = 10'



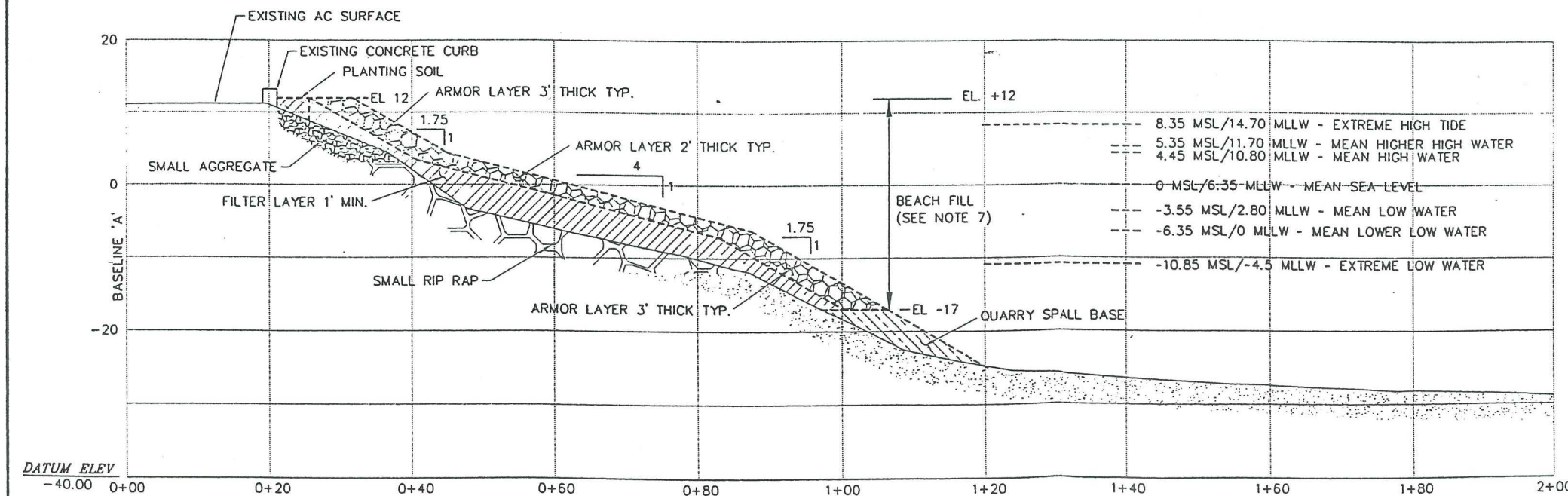
TRANSECT 22 ZONE 3
SCALE - 1" = 10'



DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON			
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON DESIGN/REMEDIAL ACTION, OPERABLE UNIT A			
SHORELINE PLAN TRANSECTS 21, 22			
FOSTER WHEELER ENVIRONMENTAL CORPORATION			
DIVISION: BE C&ES	APPROVED		
DRAWN: KSK			
CHECKED: TDC			
SIZE D	SCALE: 1"=10'	NAVFAC. DRAWING NO.	0
		BE 206-11	



TRANSECT 23 ZONE 3
SCALE - 1" = 10'



TRANSECT 24 ZONE 3
SCALE - 1" = 10'

NOTES

- SEE DRAWING BE 206-2 FOR GENERAL NOTES AND DESIGN CRITERIA.
- SEE DRAWING BE 206-3 FOR OVERALL SHORELINE PROTECTION SYSTEM LAYOUT AND DRAWING BE 206-3A FOR THE PROJECT GEOMETRY.
- SEE DRAWING BE 206-4 FOR LOCATION OF THE TRANSECTS.
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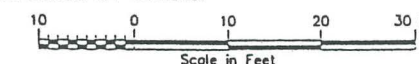


DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON			
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON DESIGN/REMEDIAL ACTION, OPERABLE UNIT A			
SHORELINE PLAN TRANSECTS 23,24			
FOSTER WHEELER ENVIRONMENTAL CORPORATION			
DIVISION: BE C&ES	APPROVED:		
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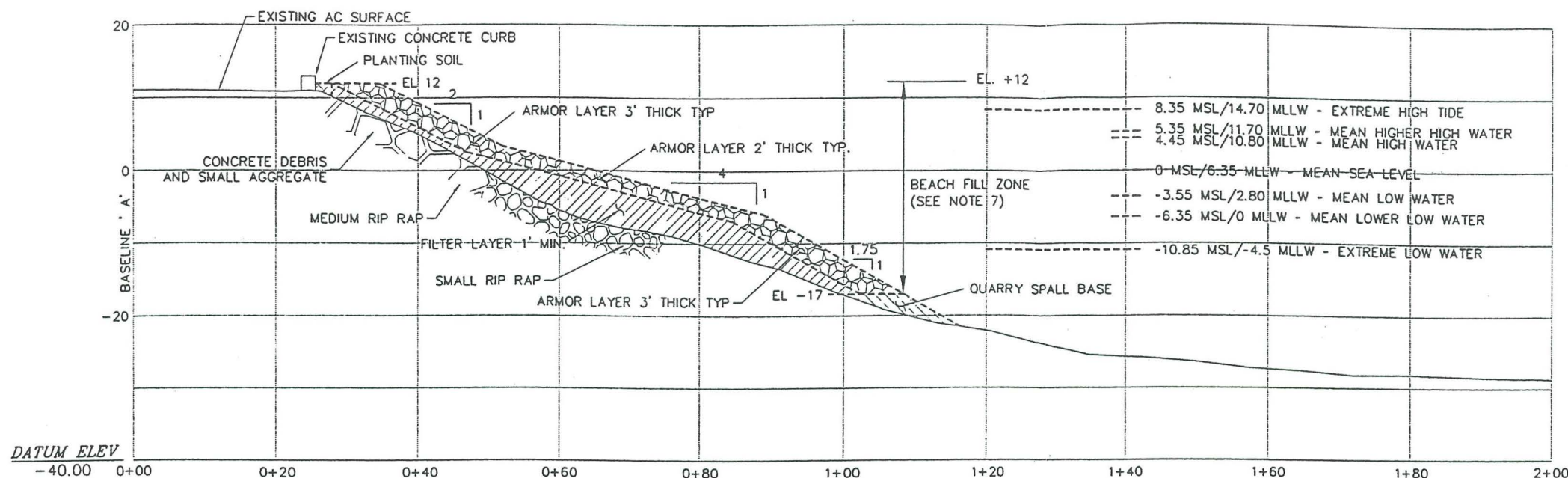
NO	DATE	REVISION	BY	CH	APPROVED
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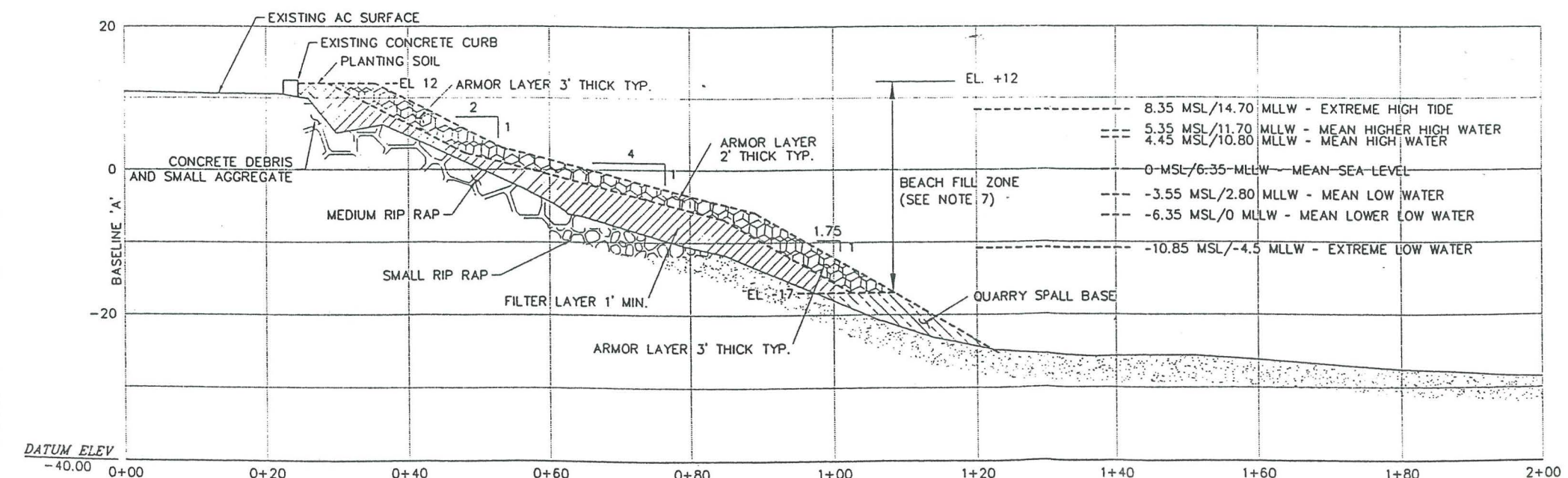
- SEE DRAWING BE 206-2 FOR GENERAL NOTES AND DESIGN CRITERIA.
- SEE DRAWING BE 206-3 FOR OVERALL SHORELINE PROTECTION SYSTEM LAYOUT AND DRAWING BE 206-3A FOR THE PROJECT GEOMETRY.
- SEE DRAWING BE 206-4 FOR LOCATION OF THE TRANSECTS.
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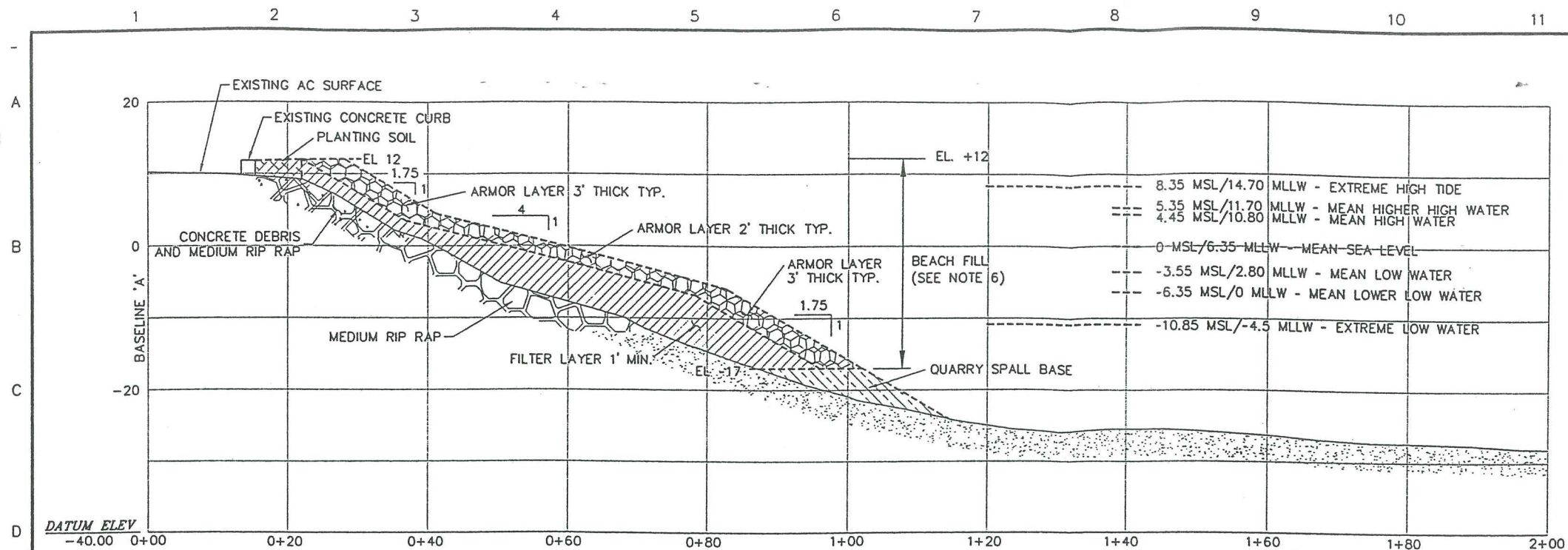
DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON	
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON DESIGN/REMEDIAL ACTION, OPERABLE UNIT A SHORELINE PLAN TRANSECTS 25,26	
FOSTER WHEELER ENVIRONMENTAL CORPORATION	
DIVISION: BE & CES	APPROVED: <i>[Signature]</i>
DRAWN: KSK	CHECKED: TDC
SIZE: D	SCALE: 1"=10'
NAVJAC DRAWING NO. BE 206-13	0



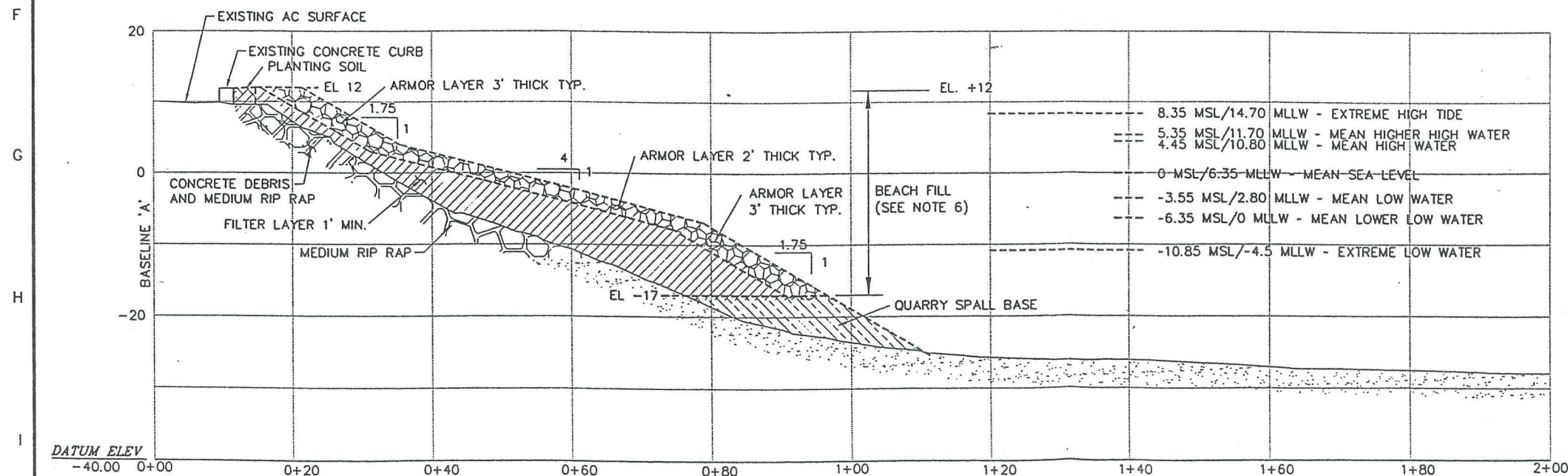
TRANSECT 25 ZONE 3
SCALE - 1" = 10'



TRANSECT 26 ZONE 3
SCALE - 1" = 10'



TRANSECT 27 ZONE 3
SCALE - 1" = 10'

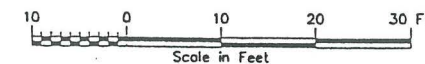


TRANSECT 31 ZONE 3
SCALE - 1" = 10'

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0	12/19/97	ISSUED FOR CONSTRUCTION	JK	JK	JK

NOTES

- SEE DRAWING BE 206-2 FOR GENERAL NOTES AND DESIGN CRITERIA.
- SEE DRAWING BE 206-3 FOR OVERALL SHORELINE PROTECTION SYSTEM LAYOUT AND DRAWING BE 206-3A FOR THE PROJECT GEOMETRY.
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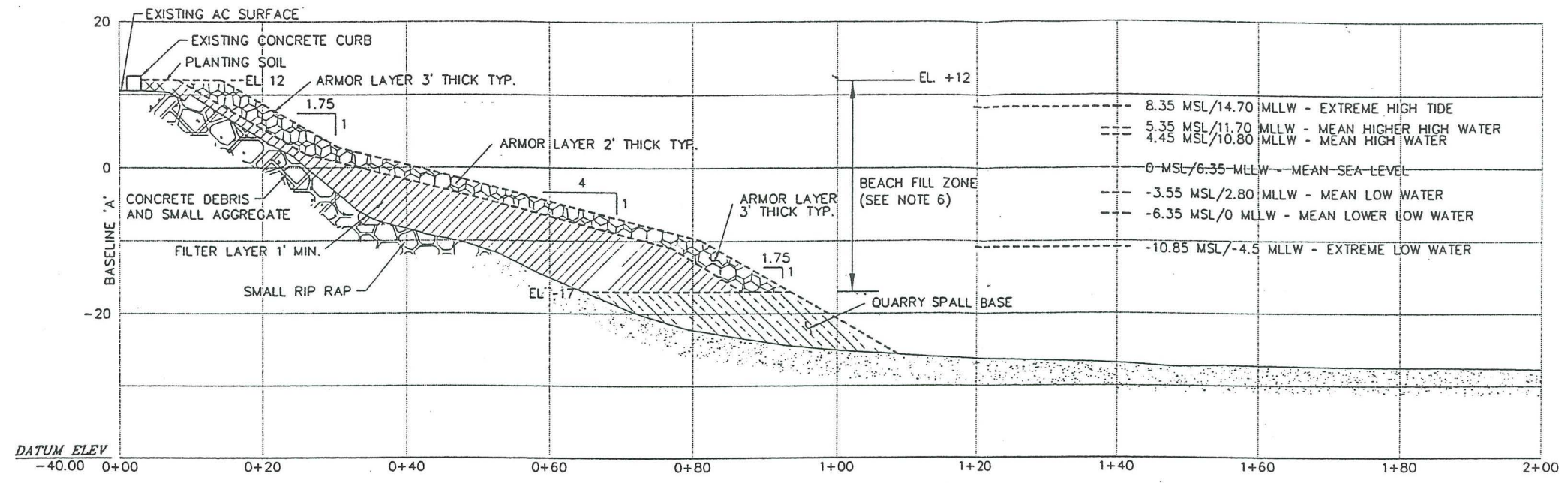
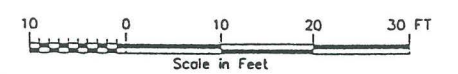


DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON			
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON DESIGN/REMEDIAL ACTION, OPERABLE UNIT A			
SHORELINE PLAN TRANSECTS 27,31			
FOSTER WHEELER ENVIRONMENTAL CORPORATION			
DIVISION: BE C&ES	APPROVED		
DRAWN: KSK			
CHECKED: TDG			
SIZE D	SCALE: 1" = 10'	NAVFAC. DRAWING NO. BE 206-14	0

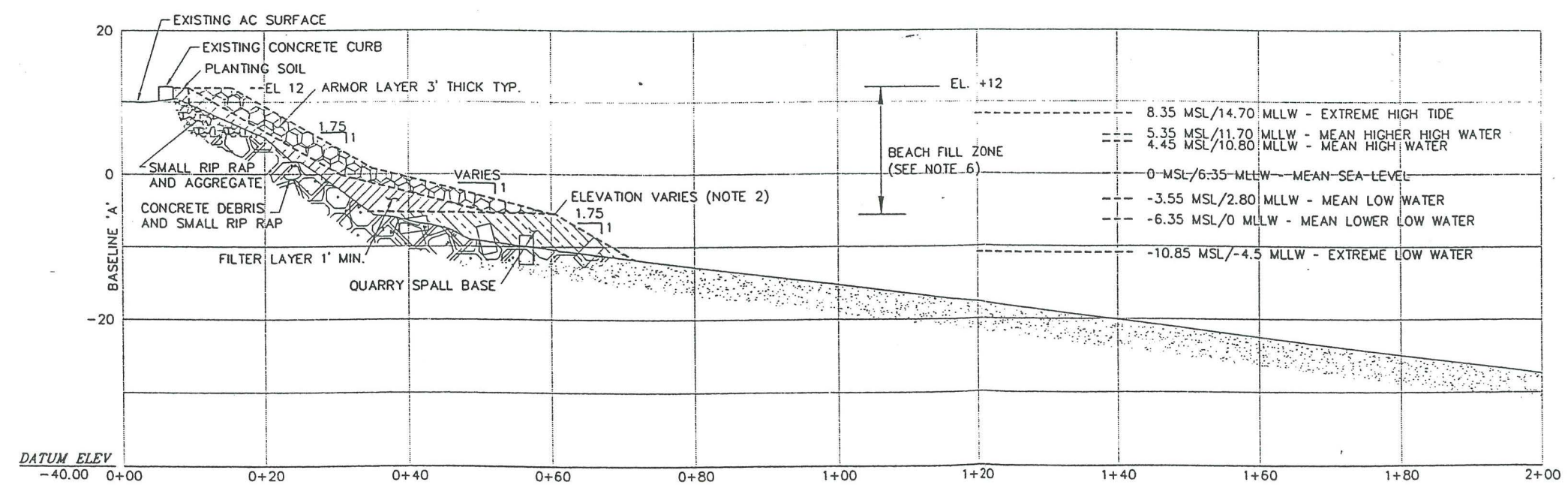
NO	DATE	REVISION	BY	CH	APPROVED
0	12/19/97	ISSUED FOR CONSTRUCTION	KSK	TDG	SP

NOTES

- SEE DRAWING BE 206-2 FOR GENERAL NOTES AND DESIGN CRITERIA.
- SEE DRAWING BE 206-3 FOR OVERALL SHORELINE PROTECTION SYSTEM LAYOUT AND DRAWING BE 206-3A FOR THE PROJECT GEOMETRY.
- SEE DRAWING BE 206-4 FOR LOCATION OF THE TRANSECTS.
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TRANSECT 28 ZONE 3
SCALE - 1" = 10'



TRANSECT 30 ZONE 3
1" = 10'

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON			
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON DESIGN/REMEDIAL ACTION, OPERABLE UNIT A			
SHORELINE PLAN TRANSECTS 28,30			
FOSTER WHEELER ENVIRONMENTAL CORPORATION			
DIVISION: BE C&ES	DRAWN: KSK	CHECKED: TDG	APPROVED:
SIZE: D	SCALE: 1"=10'	NAVFAC DRAWING NO. BE 206-15	0

Segment 43

SECTION 02270

SLOPE PROTECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

The provisions and intent of the contract, including the General Conditions, apply to this work as if specified in this section. Work related to this section is described in Section 02483, Beach Mix Habitat Enhancement.

1.02 DESCRIPTION OF WORK

The work includes furnishing all material, labor and equipment necessary for placing rock riprap on the slope as shown on the drawings and described in this specification.

PART 2 – PRODUCTS

Riprap rock shall be selected from material currently existing along the shoreline at Charleston Beach. Material to be reused shall be selected to provide the desired distribution of various stone sizes. Material in the 12" to 24" size range shall be selected for this purpose.

PART 3 - EXECUTION

3.01 DEBRIS ON EXISTING SLOPES

Prior to placement of riprap, remove and salvage all debris that would prevent the rock from keying in to the underlying riprap.

3.02 PLACING OF RIPRAP ROCK MATERIALS

The intent of this work is to provide a compact blanket of rock riprap at the transition between the beach mix and the existing riprap slope. Rock riprap shall be placed in a manner which will produce a close-fitting and well-keyed mass of rock with minimum percentage of voids and shall be constructed to the lines, grades, and thicknesses shown. The riprap shall be placed over the existing slope to its full course thickness in one operation and in such a manner as to avoid displacing the underlying material. Placing the riprap by any method likely to cause segregation will not be permitted. The larger rock shall be well distributed and all the rock shall be so placed and distributed that there will be no large accumulation or areas composed predominately of either the larger or smaller pieces of rock. Hand placing or rearranging of individual rock by mechanical equipment may be required to secure results specified above. There shall be no loose or unkeyed rocks on the slope and any unkeyed rock shall promptly be removed or repositioned. A tolerance from slope lines of minus 0.5 or plus 1 foot from top elevations and from slope lines shown on the drawings will be allowed in finished surface, except that either extreme of such tolerance shall not be continuous over an area greater than 200 square feet.

In general, all slope protection materials shall be placed from the lower elevations to the higher elevations.

3.03 MAINTENANCE

Maintain the riprap blanket until accepted and any material displaced by any cause shall be replaced to the lines and grades shown at no additional cost.

END OF SECTION

SECTION 02457
STEEL SHEET PILES

1.0 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A36/A36M	(1997; Rev. A) Carbon Structural Steel
ASTM A572/A572M	High -Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A690/A690M	(1994) High-Strength Low-Alloy Steel H-Piles and Sheet Piling for Use in Marine Environments
ASTM A857/A857M	(1997) Steel Sheet Piling, Cold Formed, Light Gage

AMERICAN WELDING SOCIETY, INC. (AWS)

AWS D1.1	(1998) Structural Welding Code - Steel
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1.2 SUBMITTALS

Submit the following:

SD-02 Manufacturer's Catalog Data

Pile Driving Equipment:

Submit descriptions of pile driving equipment to be employed in the work. Descriptive information includes manufacturer's name, model numbers, capacity, rated energy, hammer details, cushion material, helmet, and templates.

SD-11 Closeout Submittals

Pile driving record

1.3 HANDLING AND STORAGE

Handle piling using handling holes or lifting devices. Support on level blocks or racks spaced not more than 10 feet apart and not more than 2 feet from the ends. Supports between multiple lifts shall be in a vertical plane.

1.4 EQUIPMENT

Pile Driving Equipment:

Submit descriptions of pile driving equipment to be employed in the work. Descriptive information includes manufacturer's name, model numbers, capacity, rated energy, hammer details, cushion material, helmet, and templates.

2.0 PRODUCTS

Steel Sheet Piles:

Meet the requirements specified herein, or as otherwise approved. Sheet pile shall be hot-rolled and conform to ASTM A572/A572M, Grade 50. The minimum section modulus shall be 12.45 in³/ft. The interlock of sheet piling shall be free sliding, allow a swing angle of at least 5 degrees when threaded and maintain continuous interlocking when installed. Sheet piling including special fabricated sections shall be full-length sections of the dimensions shown. Fabricated sections shall conform to the requirements herein and the piling manufacturer's recommendations for fabricated sections. Provide sheet piling with standard pulling holes.

3.0 EXECUTION

3.1 INSTALLATION

3.1.1 Pile Hammer

Use a pile hammer having a delivered force or energy suitable for the total weight of the pile and the character of subsurface material to be encountered. Operate hammer at the rate(s) recommended by the manufacturer throughout the entire driving period. Repair damage to piling caused by use of a pile hammer with excess delivered force or energy.

3.1.2 Templates

Prior to driving, provide template or driving frame suitable for aligning, supporting, and maintaining sheet piling in the correct position during setting and driving. Use a system of structural framing sufficiently rigid to resist lateral and driving forces and to adequately support the sheet piling until design tip elevation is achieved. Provide at least two levels of support, not less than 20 feet apart. Templates shall not move when supporting sheet piling. Fit templates with wood blocking to bear against the web of each alternate sheet pile and hold the sheet pile at the design location alignment. Provide outer template straps or other restraints as necessary to prevent the sheets from warping or wandering from the alignment. Mark template for the location of the leading edge of each alternate sheet pile. If in view, also mark the second level to assure that the piles are vertical and in position. If two guide marks cannot be seen, other means must be used to keep the sheet pile vertical along its leading edge.

3.1.3 Pile Driving

Maintain piling vertical during driving. Drive piles in such a manner as to prevent damage to the piles and to provide a continuous closure. Where possible, drive Z-pile with the ball end leading. If an open socket is leading, a bolt or similar object placed in the bottom of the interlock will minimize packing material into it and ease driving for the next sheet. Incrementally sequence driving of individual piles such that the tip of any sheet pile shall not be more than 4 feet below that of any adjacent sheet pile. When the penetration resistance exceeds five blows per inch, the tip of any sheet pile shall not be more than 2 feet below any adjacent sheet pile.

3.1.4 Jetting of Piles

Jetting will not be permitted.

3.1.5 Pre-Augering or Spudding of Piles

Pre-augering or spudding of piles will not be permitted.

3.1.6 Cutting and Splicing

Piles driven to refusal or the point where additional penetration cannot be attained and are extending above the required top elevation in excess of the specified tolerance shall be cut off to the required elevation. Piles driven below the required top elevation and piles damaged by driving and cut off to permit further driving shall be extended as required to reach the top elevation by splicing when directed by the Contracting Officer. Piles adjoining spliced piles shall be full length unless otherwise approved. Welding of splices shall conform to the requirements of AWS D1.1. Ends of piles to be spliced shall be squared before splicing to eliminate dips or camber. Splice piles with concentric alignment of the interlocks so that there are no discontinuities, dips or camber at the abutting interlocks. Spliced piles shall be free sliding and able to obtain the maximum swing with contiguous piles. Trim the tops of piles excessively battered during driving, when directed at no cost to the Government. Pile cut-offs shall become the property of the Subcontractor and shall be removed from the site. Use a straight edge in cutting by burning to avoid abrupt nicks. Boltholes shall be drilled or may be burned and reamed by approved methods that will not damage the surrounding metal. Holes other than boltholes shall be reasonably smooth and the proper size for rods or other items to be inserted.

3.1.7 Welding

Shop and field welding, qualification of welding procedures, welders, and welding operators shall be in accordance with AWS D1.1.

3.1.8 Tolerances in Driving

Drive all piles with a variation from vertical of not more than 1/4 inch per foot. Place the pile so the face will not be more than 6 inches from vertical alignment at any point. Top of pile at elevation of cut-off shall be within 1/2 inch horizontally and 2 inches vertically of the location indicated. Manipulation of piles to force them into position will not be permitted. Check all piles for heave. Redrive all heaved piles to the required tip elevation.

3.2 INSPECTION

Perform continuous inspection during pile driving. Inspect all piles for compliance with tolerance requirements. Bring any unusual problems to the attention of the Navy Technical Representative.

3.3 INSTALLATION RECORDS

Maintain a pile driving record for each sheet pile. Indicate on the installation record installation dates and times, type and size of hammer, rate of operation, total driving time, dimensions of driving helmet and cap used, blows required per foot for each foot of penetration, final driving resistance in blows for final 6 inches, pile locations, tip elevations, ground elevations, cut-off elevations, and any reheading or cutting of piles. Record any unusual pile driving problems during driving. Submit complete records to the Site Superintendent.

END OF SECTION

SECTION 02483
BEACH MIX HABITAT ENHANCEMENT

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

The provisions and intent of the contract, including the General Conditions, apply to this work as if specified in this section.

1.02 SUBMITTALS

Submit samples of the following:

1. Beach Mix (1 each 2-gallon sample)

Submit the following test reports for the beach mix:

1. Grain Size Distribution (ASTM D-422-63)
2. Priority Pollutant Metals (EPA SW 6010B/7000 or 6020)
3. VOCs (EPA SW 846 8260B)
4. SVOCs (EPA SW 846 8270C)
5. PCBs (Aroclors only, EPA SW 846 8082) and Pesticides (EPA SW 846 8081A)

1.03 DESCRIPTION OF WORK

The work includes furnishing all material, labor and equipment necessary for providing a nominal 3-foot thick layer of imported beach mix ("Charleston Beach" mix). The work shall be performed as shown on the contract drawings and described in this specification section.

1.04 CONSTRUCTION FACILITIES

If material is barged to the site, navigation aids and lights for all marine equipment or facilities shall be installed and maintained as required by and in a manner satisfactory to the U.S. Coast Guard.

1.05 QUALITY CONTROL

Provide testing and inspection service, as required.

PART 2 – PRODUCTS

2.01 GENERAL

Materials shall be of the quantity, size shape, and gradation specified herein.

2.02 BORROW SOURCE CHARACTERIZATION

A. General

A characterization of the beach mix material shall be performed prior to any on-site placement. The characterization will include analysis of the borrow source sample, site inspection, and site characterization.

B. Source Identification

Prior to borrow source sampling, provide documentation of origin of borrow source material and maps identifying specific location of borrow source.

C. Sample(s)

Provide a representative sample (approximately 2 gallons) of material from the borrow source. Assure the sample is representative of all materials to be imported. A sample shall be provided approximately 1 month before delivery of materials to the site.

D. Inspection of Source

Inspect the borrow source. During the inspection, assure that the materials to be delivered to the site are likely to meet the appropriate specifications.

E. Testing, Reporting and Certification

Submit test sample results for material to be imported. Testing shall include the following:

1. Grain Size Distribution (ASTM D-422-63)
2. Priority Pollutant Metals (EPA SW 6010B/7000 or 6020)
3. VOCs (EPA SW 846 8260B)
4. SVOCs (EPA SW 846 8270C)
5. PCBs (Aroclors only, EPA SW 846 8082) and Pesticides (EPA 846 8081A)

The results of such tests shall be provided at least two weeks before delivery of the materials to the site. The results shall be provided in report form where the reports clearly identify the following:

1. Source of samples
2. Sampling dates
3. Chain of custody
4. Sampling locations
5. Certification that the samples tested and the results provided are representative of the materials that shall be delivered to the site.

Acceptance of the beach mix will be based on meeting the grain size distribution specified in Part 2.03 and meeting the Bremerton-Kitsap County Health District Guideline 99-02-GL attached to this specification.

F. Inspection of Materials at the Site

Bargeloads or truckloads of imported material shall be visually inspected upon delivery. Material shall be inspected for presence of foreign, recycled, or reprocessed material. Material may be rejected due to identification of any such material or as a result of substandard test results. Materials may be segregated for testing based on appearance or odor.

2.03 BEACH MIX

The beach mix shall not be derived from blasting or crushing operations. This aggregate will be well graded, round, and smooth. It will be free of organic debris and will be obtained from a gravel or sand pit. The grain size distribution for the material will be as follows:

<u>Sieve Size</u>	<u>% Passing (by weight)</u>
2 inch	100
3/4 inch	85-90
US #4	58-75
US #10	35-60
US #40	10-25
US #100	0-5

PART 3 – EXECUTION

3.01 CONSTRUCTION PERIOD

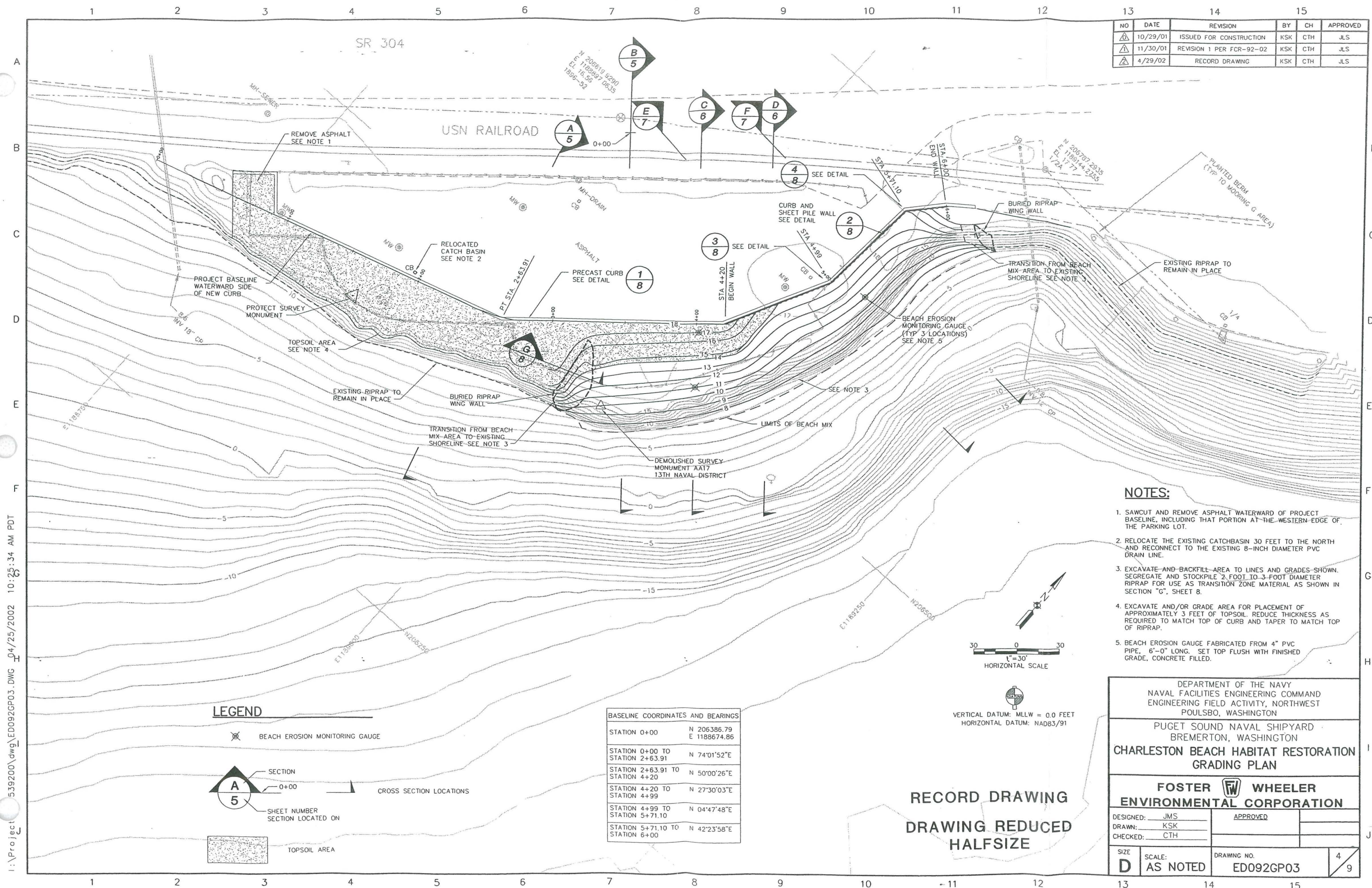
No in-water work may be performed during the fishery closure period, which is February 15 through July 15 of each year.

3.02 BEACH MIX PLACEMENT

A layer of beach mix approximately 3 feet in thickness shall be placed as shown on the drawings. A tolerance of plus 6-inches, minus 0-inches shall be maintained on the elevations shown on the drawings..

END OF SECTION

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NO	DATE	REVISION	BY	CH	APPROVED
1	10/29/01	ISSUED FOR CONSTRUCTION	KSK	CTH	JLS
2	11/30/01	REVISION 1 PER FCR-92-02	KSK	CTH	JLS
3	4/29/02	RECORD DRAWING	KSK	CTH	JLS

- NOTES:**
1. SAWCUT AND REMOVE ASPHALT WATERWARD OF PROJECT BASELINE, INCLUDING THAT PORTION AT THE WESTERN EDGE OF THE PARKING LOT.
 2. RELOCATE THE EXISTING CATCHBASIN 30 FEET TO THE NORTH AND RECONNECT TO THE EXISTING 8-INCH DIAMETER PVC DRAIN LINE.
 3. EXCAVATE AND BACKFILL AREA TO LINES AND GRADES SHOWN. SEGREGATE AND STOCKPILE 2 FOOT TO 3 FOOT DIAMETER RIPRAP FOR USE AS TRANSITION ZONE MATERIAL AS SHOWN IN SECTION "G", SHEET 8.
 4. EXCAVATE AND/OR GRADE AREA FOR PLACEMENT OF APPROXIMATELY 3 FEET OF TOPSOIL. REDUCE THICKNESS AS REQUIRED TO MATCH TOP OF CURB AND TAPER TO MATCH TOP OF RIPRAP.
 5. BEACH EROSION GAUGE FABRICATED FROM 4" PVC PIPE, 6'-0" LONG. SET TOP FLUSH WITH FINISHED GRADE, CONCRETE FILLED.

BASELINE COORDINATES AND BEARINGS	
STATION 0+00	N 206386.79 E 1188674.86
STATION 0+00 TO STATION 2+63.91	N 74°01'52"E
STATION 2+63.91 TO STATION 4+20	N 50°00'26"E
STATION 4+20 TO STATION 4+99	N 27°30'03"E
STATION 4+99 TO STATION 5+71.10	N 04°47'48"E
STATION 5+71.10 TO STATION 6+00	N 42°23'58"E

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY, NORTHWEST
POULSBORO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON

**CHARLESTON BEACH HABITAT RESTORATION
GRADING PLAN**

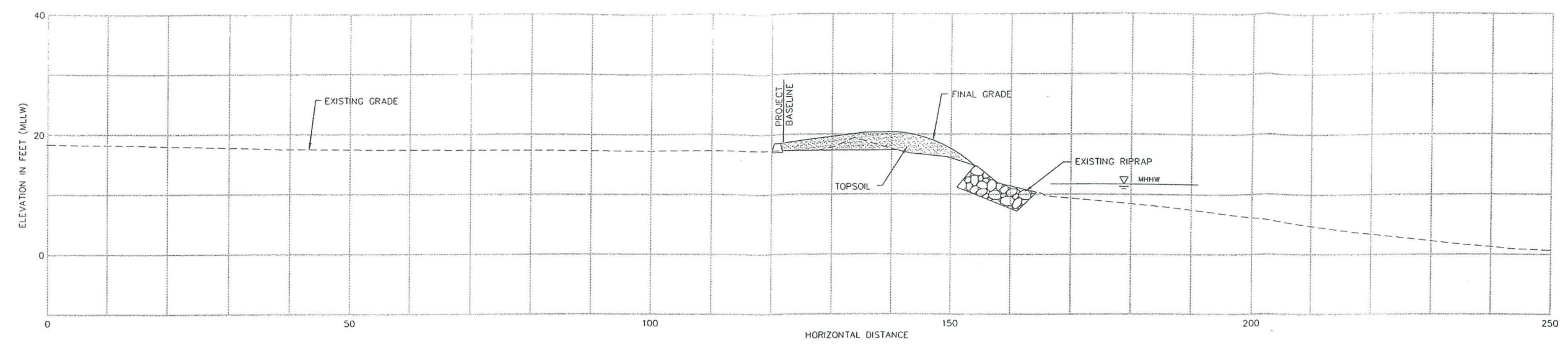
**FOSTER WHEELER
ENVIRONMENTAL CORPORATION**

DESIGNED: JMS	APPROVED:	
DRAWN: KSK		
CHECKED: CTH		

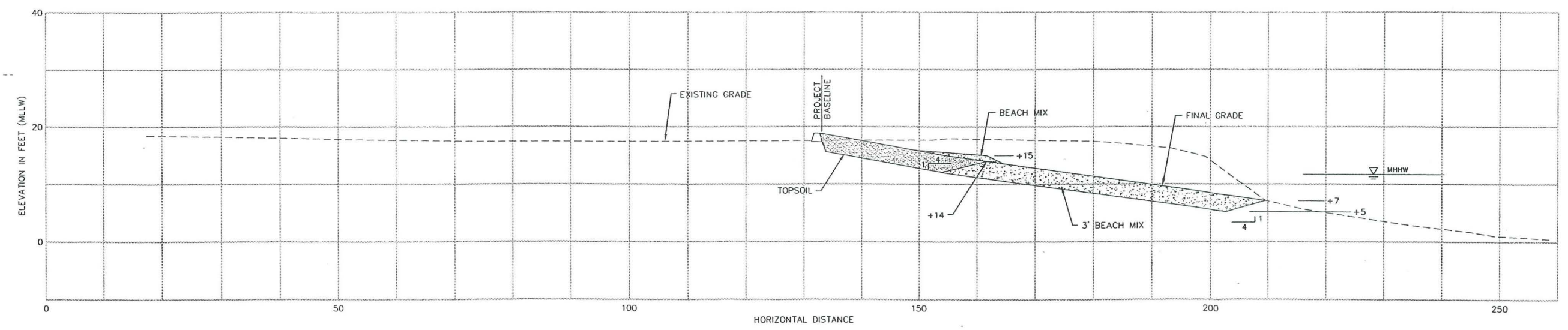
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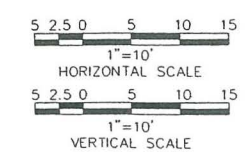
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2	11/30/01	REVISION 1 PER FCR-92-02	KSK	CTH	JLS
3	4/29/02	RECORD DRAWING	KSK	CTH	JLS



SECTION A
4



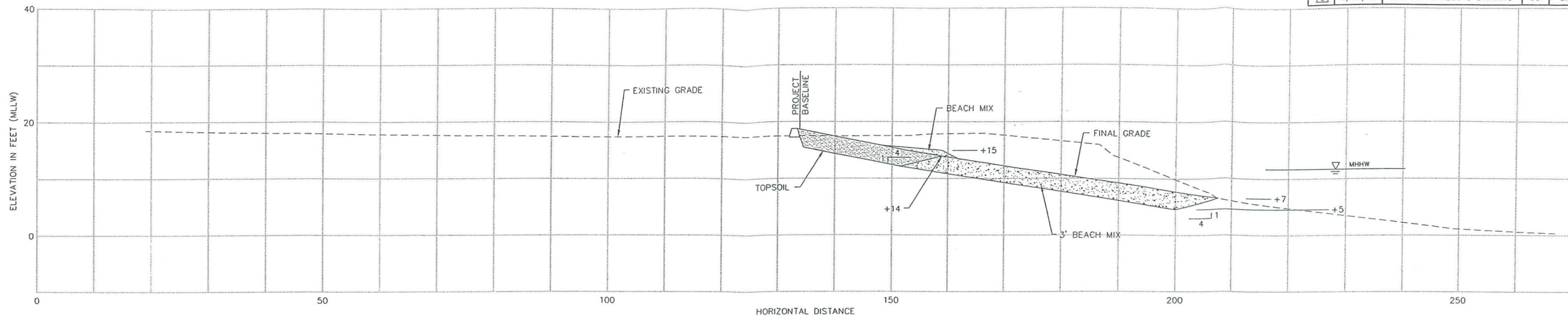
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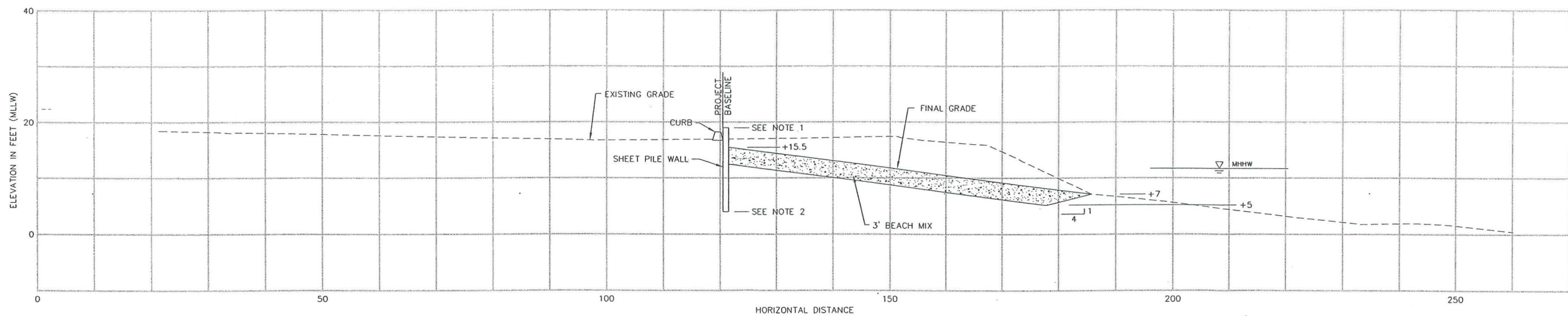
RECORD DRAWING
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HALFSIZE

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBO, WASHINGTON			
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON CHARLESTON BEACH HABITAT RESTORATION CROSS SECTIONS A & B			
FOSTER WHEELER ENVIRONMENTAL CORPORATION			
DESIGNED: JMS	APPROVED		
DRAWN: KSK			
CHECKED: CTH			
SIZE D	SCALE: AS NOTED	DRAWING NO. ED092XS05	5/9

NO	DATE	REVISION	BY	CH	APPROVED
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2	11/30/01	REVISION 1 PER FCR-92-02	KSK	CTH	JLS
3	4/29/02	RECORD DRAWING	KSK	CTH	JLS
4	6/28/02	REVISION 3 RECORD DRAWING	DD	SM	JMS



SECTION C
4



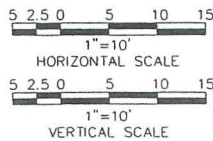
SECTION D
4

NOTES:

- TO BETTER FOLLOW ELEVATIONS OF EXISTING ASPHALT, TOP OF SHEET PILE ELEVATIONS ARE AS FOLLOWS:
STA. 4+20 TO 5+24 - ELEV. 17.5' MLLW
STA. 5+24 TO 5+45 - ELEV. 18.0' MLLW
STA. 5+45 TO 6+00 - ELEV. 18.33' MLLW

2. PILE DRIVING RECORD SUMMARY

PAIR NUMBER (starts at 4+20)	PILE LENGTH	CUT-OFF ELEVATION	PENETRATION	TIP ELEVATION
1 - 10	17.5 feet	17.5 feet	17 feet	0.5 feet
11 - 29 plus corner	17.5 feet	17.5 feet	15 feet	2.5 feet
30 - 33	17.5 feet	17.5 feet	16 feet	1.5 feet
34	17.5 feet	17.5 feet	15 feet	2.5 feet
35 - 39	17.5 feet	18 feet	15 feet	3 feet
40 - 41	17.5 feet	18 feet	15 feet	3 feet
42 - 57 feet	17.5 feet	18.33 feet	15.5 feet	2.83 feet
58 - 60 plus corner	17.5 feet	18.33 feet	15.5 feet	2.83 feet



RECORD DRAWING
DRAWING REDUCED
HALFSIZE

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POULSBORO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON
CHARLESTON BEACH HABITAT RESTORATION
CROSS SECTIONS C & D

FOSTER
WHEELER
ENVIRONMENTAL CORPORATION

DESIGNED: JMS
DRAWN: KSK
CHECKED: CTH

APPROVED

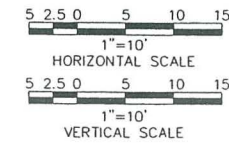
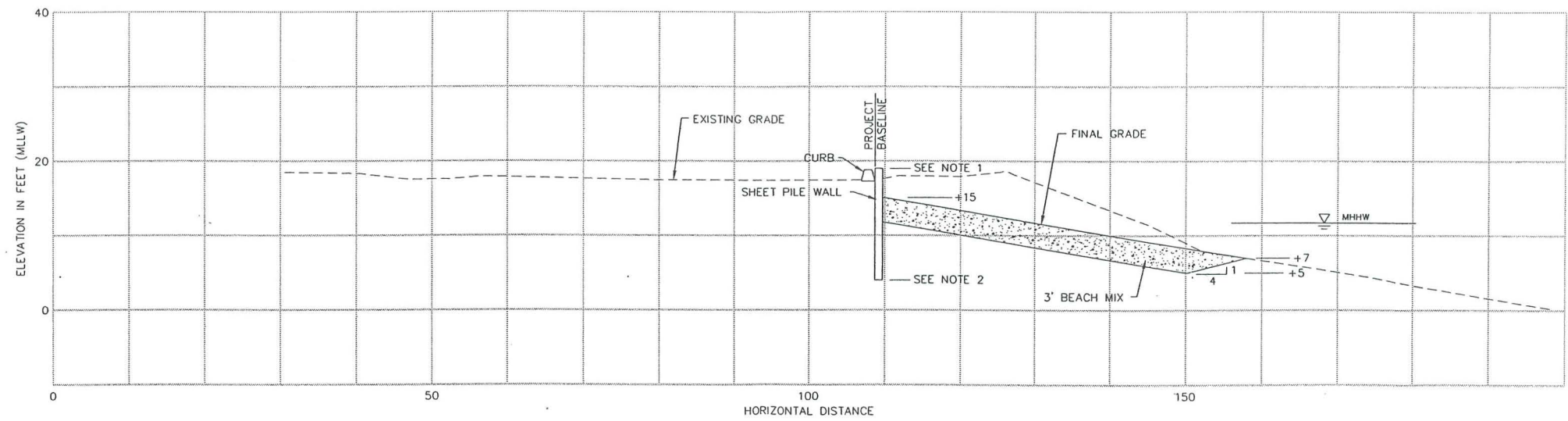
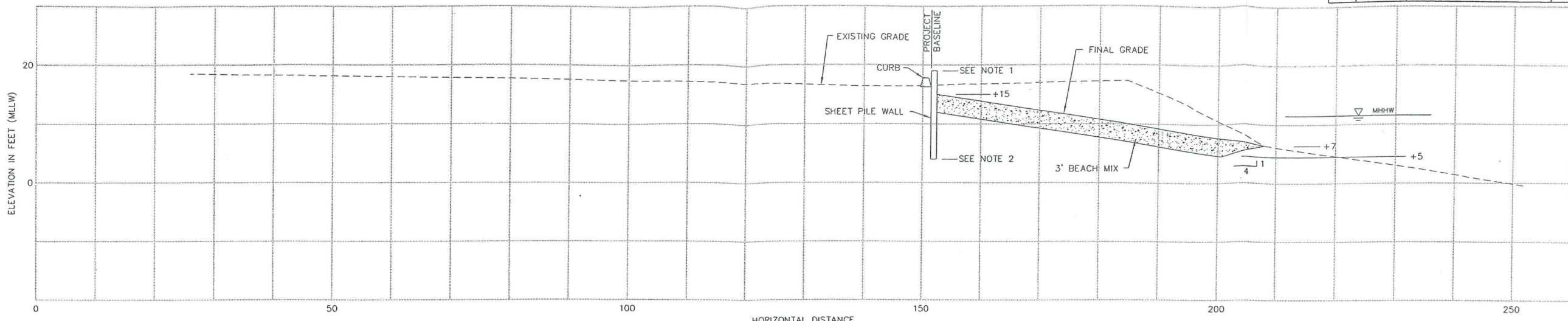
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3	4/29/02	RECORD DRAWING	KSK	CTH	JLS
4	6/28/02	REVISION 3 RECORD DRAWING	DD	SM	JMS



NOTES:

- TO BETTER FOLLOW ELEVATIONS OF EXISTING ASPHALT, TOP OF SHEET PILE ELEVATIONS ARE AS FOLLOWS:
STA. 4+20 TO 5+24 - ELEV. 17.5' MLLW
STA. 5+24 TO 5+45 - ELEV. 18.0' MLLW
STA. 5+45 TO 6+00 - ELEV. 18.33' MLLW

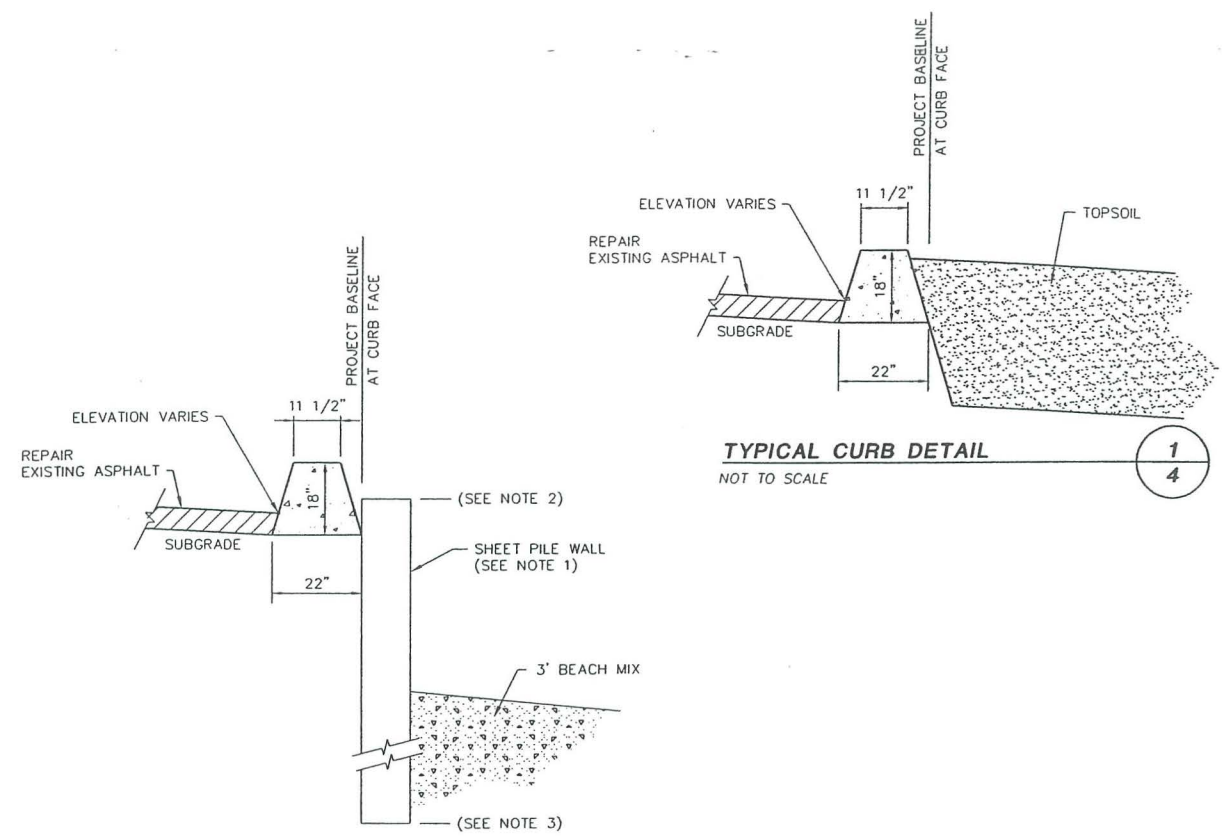
2. PILE DRIVING RECORD SUMMARY

PAIR NUMBER (starts at 4+20)	PILE LENGTH	CUT-OFF ELEVATION	PENETRATION	TIP ELEVATION
1 - 10	17.5 feet	17.5 feet	17 feet	0.5 feet
11 - 29 plus corner	17.5 feet	17.5 feet	15 feet	2.5 feet
30 - 33	17.5 feet	17.5 feet	16 feet	1.5 feet
34	17.5 feet	17.5 feet	15 feet	2.5 feet
35 - 39	17.5 feet	18 feet	15 feet	3 feet
40 - 41	17.5 feet	18 feet	15 feet	3 feet
42 - 57 feet	17.5 feet	18.33 feet	15.5 feet	2.83 feet
58 - 60 plus corner	17.5 feet	18.33 feet	15.5 feet	2.83 feet

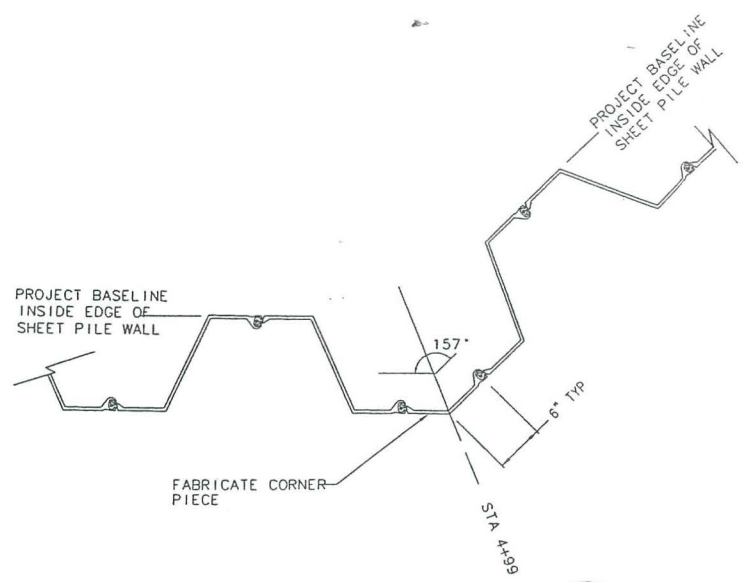
**RECORD DRAWING
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DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON	
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON CHARLESTON BEACH HABITAT RESTORATION CROSS SECTIONS E & F	
FOSTER WHEELER ENVIRONMENTAL CORPORATION	
DESIGNED: JMS	APPROVED:
DRAWN: KSK	
CHECKED: CTH	
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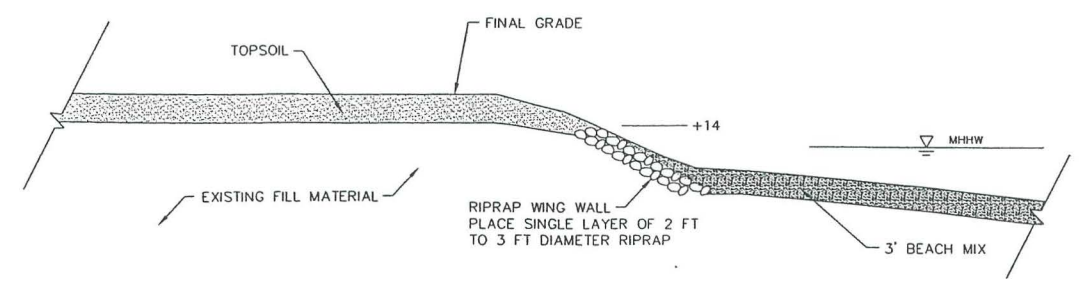
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4	6/28/02	REVISION 3 RECORD DRAWING	DD	SM	JMS



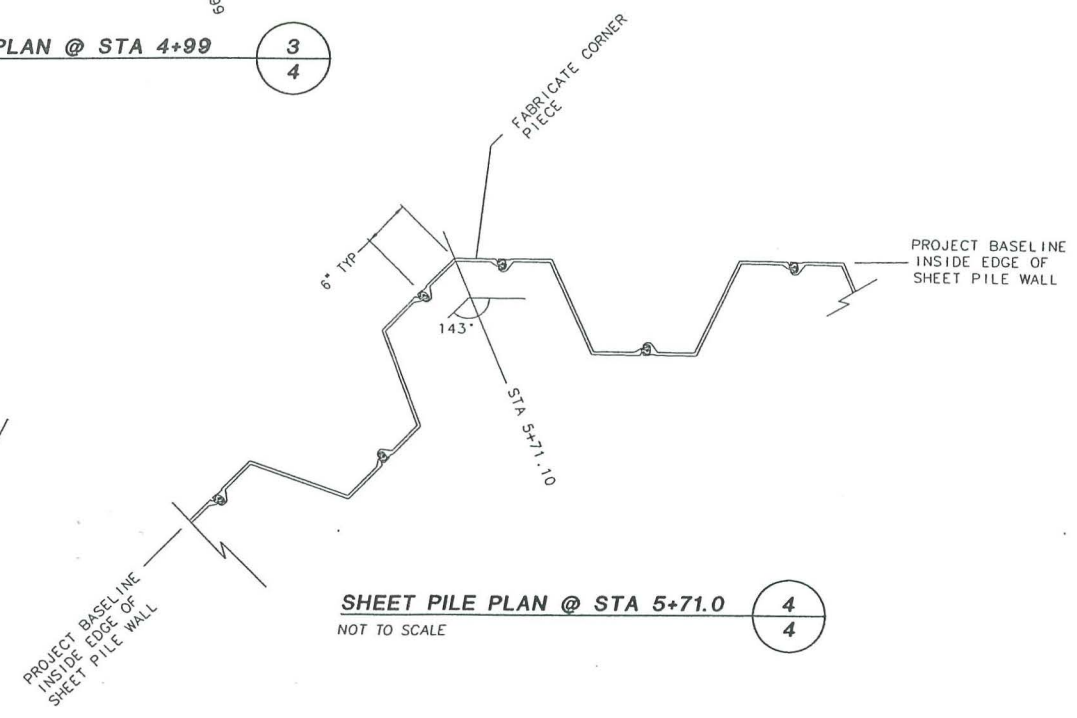
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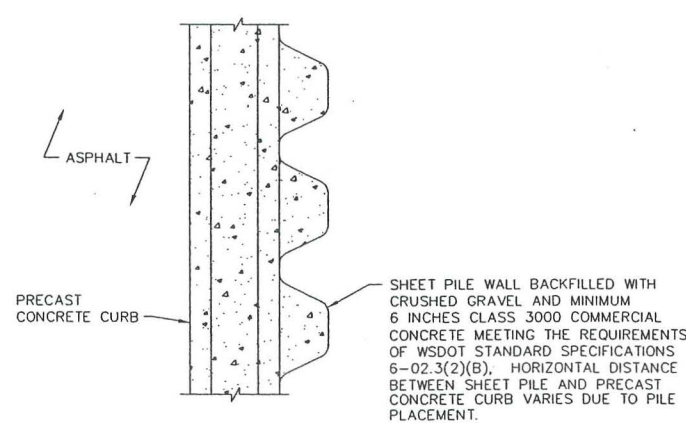
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TRANSITION SECTION
NOT TO SCALE



SHEET PILE PLAN @ STA 5+71.0
NOT TO SCALE



TYPICAL CURB AND SHEET PILE WALL DETAIL
NOT TO SCALE

NOTES:

- SEE SPECIFICATIONS SECTION 02457 FOR MATERIAL DETAILS.
- TO BETTER FOLLOW ELEVATIONS OF EXISTING ASPHALT, TOP OF SHEET PILE ELEVATIONS ARE AS FOLLOWS:
STA. 4+20 TO 5+24 - ELEV. 17.5' MLLW
STA. 5+24 TO 5+45 - ELEV. 18.0' MLLW
STA. 5+45 TO 6+00 - ELEV. 18.33' MLLW
- PILE DRIVING RECORD SUMMARY:

PAIR NUMBER (starts at 4+20)	PILE LENGTH	CUT-OFF ELEVATION	PENETRATION	TIP ELEVATION
1 - 10	17.5 feet	17.5 feet	17 feet	0.5 feet
11 - 29 plus corner	17.5 feet	17.5 feet	15 feet	2.5 feet
30 - 33	17.5 feet	17.5 feet	16 feet	1.5 feet
34	17.5 feet	17.5 feet	15 feet	2.5 feet
35 - 39	17.5 feet	18 feet	15 feet	3 feet
40 - 41	17.5 feet	18 feet	15 feet	3 feet
42 - 57 feet	17.5 feet	18.33 feet	15.5 feet	2.83 feet
58 - 60 plus corner	17.5 feet	18.33 feet	15.5 feet	2.83 feet

**RECORD DRAWING
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HALFSIZE**

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POULSBORO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON
**CHARLESTON BEACH HABITAT RESTORATION
SECTIONS AND DETAILS**

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

DESIGNED: JMS
DRAWN: KSK
CHECKED: CTH

APPROVED

SIZE: **D**
SCALE: **AS NOTED**

DRAWING NO.
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Segment 44

SECTION 02483
FISH ROCK HABITAT ENHANCEMENT

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

The provisions and intent of the contract, including the General Conditions, apply to this work as if specified in this section. Work related to this section is described in, Section 02270, Slope Protection.

1.02 SUBMITTALS

Submit samples of the following:

1. Fish Rock Habitat Mix

Submit test reports for the following fish rock materials:

1. Grain Size Distribution (ASTM D-422-63)
2. Priority Pollutant Metals (EPA SW 6010B/7000 or 6020)
3. Volatile Organic Compounds (EPA SW 846 8260B)
4. Semivolatile Organic Compounds (EPA SW 846 8270C)
5. PCBs (Aroclors only, EPA SW 846 8082) and Pesticides (EPA SW 846 8081A)

Documentation and location of fish rock materials source

1. Approximately 1-gallon sample of proposed fish rock material

1.03 DESCRIPTION OF WORK

The work includes furnishing all material, labor and equipment necessary for 1) providing a nominal six inch thick blanket of imported fish rock habitat mix over the sediments in the intertidal zone near Operable Unit A. The work shall be performed as shown on the contract drawings and described in this specification section.

1.04 CONSTRUCTION FACILITIES

If material is barged to the site, navigation aids and lights for all marine equipment or facilities shall be installed and maintained as required by and in a manner satisfactory to the U.S. Coast Guard.

1.05 QUALITY CONTROL

Provide testing and inspection service, as required.

PART 2 - PRODUCTS

2.01 GENERAL

Materials shall be of the quantity, size shape, and gradation specified herein.

2.02 BORROW SOURCE CHARACTERIZATION

A. General

A characterization of the Fish Rock material shall be performed prior to any on-site placement. The characterization will include analysis of the borrow source sample, site inspection, and site characterization.

B. Source Identification

Prior to borrow source sampling, provide documentation of origin of borrow source material and maps identifying specific location of borrow source.

C. Sample(s)

Provide a representative sample (approximately 1 gallon) of material from the borrow source. Each sample should be a composite of no less than five subsamples taken throughout the source. Assure the sample(s) are representative of all materials to be imported. Samples shall be provided at least one month before delivery of materials to the site.

D. Inspection of Source

Inspect the borrow source. During the inspection, assure that the materials to be delivered to the site are likely to meet the appropriate specifications.

E. Testing, Reporting and Certification

Submit test sample(s) of materials to be imported for the following:

1. Grain Size Distribution (ASTM D-422-63)
2. Priority Pollutant Metals (EPA SW 6010B/7000 or 6020)
3. Volatile Organic Compounds (EPA SW 846 8260B)
4. Semivolatile Organic Compounds (EPA SW 846 8270C)
5. PCBs (Aroclors only, EPA SW 846 8082) and Pesticides (EPA 846 8081A)

The results of such tests shall be provided at least two weeks before delivery of the materials to the site. The results shall be provided in report form where the reports clearly identify the following:

1. Source of samples
2. Sampling dates
3. Chain of custody
4. Sampling locations
5. Certification that the samples tested and the results provided are representative of the materials that shall be delivered to the site.

F. Inspection of Materials at the Site

Bargeloads or truckloads of imported material shall be visually inspected upon delivery. Material shall be inspected for presence of foreign, recycled, or reprocessed material. Material may be rejected due to identification of any such material or as a result of substandard test results. Materials may be segregated for testing based on appearance or odor.

2.03 FISH ROCK HABITAT MIX

The fish rock habitat mix to be placed as a thin-cap shall not be derived from blasting or crushing operations. This aggregate will be well graded, round, and smooth. It will be free of organic debris and will be obtained from a gravel or sand pit. The grain size distribution for the material will be as follows:

<u>Sieve Size</u>	<u>% Passing (by Wgt.)</u>
1 inch	100
1/2 inch	80-100
3/8 inch	40-80
US #8	25-60
US #16	15-35
US #20	10-20
US #40	2-8

PART 3 - EXECUTION

3.01 CONSTRUCTION PERIOD

No in-water work may be performed during the fishery closure period, which is February 15 through June 15 of each year.

3.02 FISH ROCK MIX PLACEMENT

A thin layered cap of fish rock mix approximately six inches in thickness shall be placed in the nearshore area near Operable Unit A from the toe of the new sheet pile bulkhead outward approximately 8 feet as shown on the drawings. A tolerance of plus 6-inches and 0-inch below section thickness or elevations shown on the drawings will be allowed in the finished surface.

END OF SECTION

SECTION 02457
STEEL SHEET PILES

1.0 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A-36/A 36M	(1997; Rev. A) Carbon Structural Steel
ASTM A-123	(1997); Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A-307	(1997) Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A-325M	(1993) High-Strength Bolts for Structural Steel Joints (Metric)
ASTM A-690/A 690M	(1994) High-Strength Low-Alloy Steel H-Piles and Sheet Piling for Use in Marine Environments
ASTM A-857/A 857M	(1997) Steel Sheet Piling, Cold Formed, Light Gage

AMERICAN WELDING SOCIETY, INC. (AWS)

AWS D1.1	(1998) Structural Welding Code - Steel
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1.2 SUBMITTALS

Submit the following:

SD-02 Manufacturer's Catalog Data

Pile driving equipment

Submit descriptions of pile driving equipment to be employed in the work. Descriptive information includes manufacturer's name, model numbers, capacity, rated energy, hammer details, cushion material, helmet, templates, and jetting equipment.

SD-04 Shop Drawings

Steel sheet piles

Submit drawings for approval prior to start of the work or ordering materials. Include details of top protection, special reinforcing tips, tip protection, lagging, splices, fabricated additions to plain piles and driving, cut-off method, and corrosion protection. Drawings for sheet piling including fabricated sections shall show complete dimensions including minimum section properties and details of piling and the driving sequence and location of piling. Include details and dimensions of templates and other temporary guide structures for installing the piling. Provide details of the method of handling piling to prevent permanent deflection, distortion or damage to piling interlocks.

SD-06 Test Reports

Interlock tension strength test

Conform to the piling manufacturer's standard test, include testing at least two 3-inch-long coupons taken randomly from different as-produced pilings of each heat.

SD-11 Closeout Submittals

Pile driving record

SD-13 Certificates

Material certificates

Submit for each shipment certificates and identify with specific lots prior to installing piling. Identification data should include piling type, dimensions, chemical composition, mechanical properties, section properties, heat number, and mill identification mark.

1.3 REQUIREMENTS

1.3.1 Basis of Bids

Base bids on pile sections and lengths as indicated. Should the total number of piles or the number of each length vary from that specified as the basis for bidding, an adjustment in the contract price and time for completion will be made. No additional payment will be made for withdrawn, damaged, rejected, or misplaced piles; for any portion of a pile remaining above the cut-off elevation; for backdriving; for cutting off piles, or for any cut off length of piles.

1.4 DELIVERY AND STORAGE

Handle piling using handling holes or lifting devices. Handle long length piles with care to prevent damage. Support on level blocks or racks spaced not more than 10 feet apart and not more than 2 feet from the ends. Supports between multiple lifts shall be in a

vertical plane. Protect piling to prevent damage to coatings and to prevent corrosion prior to installation.

1.5 QUALITY ASSURANCE

1.5.1 Material Certificates

Submit for each shipment certificates and identify with specific lots prior to installing piling. Identification data should include piling type, dimensions, chemical composition, mechanical properties, section properties, heat number, and mill identification mark.

1.6 EQUIPMENT

1.6.1 Pile Driving Equipment

Submit descriptions of pile driving equipment to be employed in the work. Descriptive information includes manufacturer's name, model numbers, capacity, rated energy, hammer details, cushion material, helmet, templates, and jetting equipment.

2.0 PRODUCTS

2.1 STEEL SHEET PILES

Meet the requirements specified herein. Heavy gauge hot-rolled sheet piling shall conform to ASTM A-690/A 690M. The interlock of sheet piling shall be free-sliding, allow a swing angle of at least 5 degrees when threaded and maintain continuous interlocking when installed. Sheet piling including special fabricated sections shall be full-length sections of the dimensions shown. Fabricated sections shall conform to the requirements herein and the piling manufacturer's recommendations for fabricated sections. Provide sheet piling with standard pulling holes.

2.2 BOLTS, NUTS, AND WASHERS

ASTM A-307, Grade B.

3.0 EXECUTION

3.1 EARTHWORK

Perform in accordance with Section 02315, "Excavation and Fill." Pre-excavation will be permitted. Backfill as indicated.

3.2 INSTALLATION

3.2.1 Pile Hammer

Use a pile hammer having a delivered force or energy suitable for the total weight of the pile and the character of subsurface material to be encountered. Operate hammer at the rate(s) recommended by the manufacturer throughout the entire driving period. Repair damage to piling caused by use of a pile hammer with excess delivered force or energy.

3.2.2 Pile Protection

Use a protecting cap during driving to prevent damage to the top of the sheet piling.

3.2.3 Templates

Prior to driving, provide template or driving frame suitable for aligning, supporting, and maintaining sheet piling in the correct position during setting and driving. Use a system of structural framing sufficiently rigid to resist lateral and driving forces and to adequately support the sheet piling until design tip elevation is achieved. Provide at least two levels of support, not less than 20 feet apart. Templates shall not move when supporting sheet piling. Fit templates with wood blocking to bear against the web of each alternate sheet pile and hold the sheet pile at the design location alignment. Provide outer template straps or other restraints as necessary to prevent the sheets from warping or wandering from the alignment. Mark template for the location of the leading edge of each alternate sheet pile. If in view, also mark the second level to assure that the piles are vertical and in position. If two guide marks cannot be seen, other means must be used to keep the sheet pile vertical along its leading edge.

3.2.4 Pile Driving

Maintain piling vertical during driving. Drive piles in such a manner as to prevent damage to the piles and to provide a continuous closure. Where possible, drive Z-pile with the ball end leading. If an open socket is leading, a bolt or similar object placed in the bottom of the interlock will minimize packing material into it and ease driving for the next sheet. Incrementally sequence driving of individual piles such that the tip of any sheet pile shall not be more than 4 feet below that of any adjacent sheet pile. When the penetration resistance exceeds five blows per inch, the tip of any sheet pile shall not be more than 2 feet below any adjacent sheet pile.

3.2.5 Jetting of Piles

Jetting will not be permitted.

3.2.6 Pre-Augering or Spudding of Piles

Pre-augering or spudding of piles will not be permitted.

3.2.7 Cutting and Splicing

Piles driven to refusal or the point where additional penetration cannot be attained and are extending above the required top elevation in excess of the specified tolerance shall be cut off to the required elevation. Piles driven below the required top elevation and piles damaged by driving and cut off to permit further driving shall be extended as required to reach the top elevation by splicing when directed by the Contracting Officer. Piles adjoining spliced piles shall be full length unless otherwise approved. Welding of splices shall conform to the requirements of AWS D1.1. Ends of piles to be spliced shall be squared before splicing to eliminate dips or camber. Splice piles with concentric alignment of the interlocks so that there are no discontinuities, dips or camber at the abutting interlocks. Spliced piles shall be free sliding and able to obtain the maximum swing with contiguous piles. Trim the tops of piles excessively battered during driving, when directed at no cost to the Government. Pile cut-offs shall become the property of the Subcontractor and shall be removed from the site. Use a straight edge in cutting by burning to avoid abrupt nicks. Bolt holes shall be drilled or may be burned and reamed by approved methods which will not damage the surrounding metal. Holes other than bolt holes shall be reasonably smooth and the proper size for rods or other items to be inserted. Do not use explosives for cutting.

3.2.8 Welding

Shop and field welding, qualification of welding procedures, welders, and welding operators shall be in accordance with AWS D1.1.

3.2.9 Tolerances in Driving

Drive all piles with a variation from vertical of not more than 1/4 inch per foot. Place the pile so the face will not be more than 6 inches from vertical alignment at any point. Top of pile at elevation of cut-off shall be within 1/2 inch horizontally and 2 inches vertically of the location indicated. Manipulation of piles to force them into position will not be permitted. Check all piles for heave. Redrive all heaved piles to the required tip elevation.

3.2.10 Corrosion Protection

Steel sheet piling shall be hot dip galvanize coated in accordance ASTM A-123.

3.3 INSPECTION

Perform continuous inspection during pile driving. Inspect all piles for compliance with tolerance requirements. Bring any unusual problems which may occur to the attention of the Navy Technical Representative.

3.3.1 Inspection of Driven Piling

The Contractor shall inspect the interlocks of the portion of driven piles that extend above ground. Remove and replace piles found to be out of interlock.

3.3.2 Pulling and Redriving

The Subcontractor may be required to pull selected piles after driving to determine the condition of the underground portions of piles. The pile pulling method must be approved by the Foster Wheeler Environmental's Site Engineer. Remove and replace at the Subcontractor's expense any pile pulled and found to be damaged to the extent that its usefulness in the structure is impaired. Redrive piles pulled and found to be in satisfactory condition.

3.4 INSTALLATION RECORDS

Maintain a pile driving record for each sheet pile. Indicate on the installation record installation dates and times, type and size of hammer, rate of operation, total driving time, dimensions of driving helmet and cap used, blows required per foot for each foot of penetration, final driving resistance in blows for final 6 inches, pile locations, tip elevations, ground elevations, cut-off elevations, and any reheading or cutting of piles. Record any unusual pile driving problems during driving. Submit complete records to the Site Superintendent.

END OF SECTION

SECTION 03311
MARINE CONCRETE

1.0 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION
OFFICIALS (AASHTO)

AASHTO M182 (1991; R 1996) Burlap Cloth Made From Jute or Kenaf

AASHTO T259 (1993) Resistance of Concrete to Chloride Ion Penetration

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 117 (1990) Tolerances for Concrete Construction and Materials

ACI 121R (1985) Quality Assurance Systems for Concrete Construction

ACI 201.2R (1992) Durable Concrete

ACI 211.1 (1991) Selecting Proportions for Normal, Heavyweight, and Mass Concrete

ACI 214 (1977; R 1989) Evaluation of Strength Test Results of Concrete

ACI 301 (1996) Structural Concrete

ACI 304R (1989) Measuring, Mixing, Transporting, and Placing Concrete

ACI 304.2R (1996) Placing Concrete by Pumping Methods

ACI 305R (1991) Hot Weather Concreting

ACI 308 (1992) Curing Concrete

ACI 311.1R (1992) ACI Manual of Concrete Inspection

ACI 309R (1996) Consolidation of Concrete

ACI 315 (1992) Details and Detailing of Concrete Reinforcement

ACI 318/318M (1995) Building Code Requirements for Structural Concrete

ACI 347R (1994) Formwork for Concrete

ACI SP-2 (1992) ACI Manual of Concrete Inspection

ACI SP-15 (1995) Structural Concrete for Buildings ACI 301 with
Selected ACI and ASTM References

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A-82 (1997) Steel Wire, Plain, for Concrete Reinforcement
ASTM A-496 (1997) Steel Wire, Deformed, for Concrete Reinforcement
ASTM A-615/A 615M (1996; Rev. A) Deformed and Plain Billet-Steel Bars for
Concrete Reinforcement
ASTM A-616/A 616M (1996; Rev. A) Steel Deformed and Plain Bars for Concrete
Reinforcement
ASTM A-617/A 617M (1996; Rev. A) Axle-Steel Deformed and Plain Bars for
Concrete Reinforcement
ASTM A-706/A 706M (1996; Rev. A) Low-Alloy Steel Deformed Bars for Concrete
Reinforcement
ASTM A-934/A 934M (1997) Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM C-31/C 31M (1996) Making and Curing Concrete Test Specimens in the
Field
ASTM C-33 (1997) Concrete Aggregates
ASTM C-39 (1996) Compressive Strength of Cylindrical Concrete
Specimens
ASTM C-42 (1994) Obtaining and Testing Drilled Cores and Sawed Beams
of Concrete
ASTM C-94 (1997) Ready-Mixed Concrete
ASTM C-138 (1992) Unit Weight, Yield, and Air Content (Gravimetric) of
Concrete
ASTM C-143 (1990; Rev. A) Slump of Hydraulic Cement Concrete
ASTM C-150 (1997) Portland Cement
ASTM C-171 (1997) Sheet Materials for Curing Concrete
ASTM C-172 (1997) Sampling Freshly Mixed Concrete
ASTM C-173 (1994; Rev. A) Air Content of Freshly Mixed Concrete by the
Volumetric Method
ASTM C-231 (1997) Air Content of Freshly Mixed Concrete by the Pressure
Method
ASTM C-260 (1995) Air-Entraining Admixtures for Concrete
ASTM C-295 (1990) Petrographic Examination of Aggregates for Concrete

ASTM C-309	(1997) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C-441	(1996) Effectiveness of Mineral Admixtures or Ground Blast-Furnace Slag in Preventing Excessive Expansion of Concrete Due to Alkali-Silica Reaction
ASTM C-469	(1994) Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression
ASTM C-494	(1992) Chemical Admixtures for Concrete
ASTM C-496	(1996) Splitting Tensile Strength of Cylindrical Concrete Specimens
ASTM C-595M	(1997) Blended Hydraulic Cements (Metric)
ASTM C-595	(1994; Rev. A) Blended Hydraulic Cements
ASTM C-618	(1997) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C-642	(1997) Density Gravity, Absorption, and Voids in Hardened Concrete
ASTM C-881	(1990) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C-920	(1995) Elastomeric Joint Sealants
ASTM C-989	(1997) Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
ASTM C-1017	(1992) Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C-1064	(1986; R 1993) Temperature of Freshly Mixed Portland Cement Concrete
ASTM C-1077	(1997) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C-1157	(1994; Rev. A) Blended Hydraulic Cement
ASTM C-1202	(1997) Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
ASTM C-1218/C 1218M	(1997) Water-Soluble Chloride in Mortar and Concrete
ASTM D-1751	(1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D-3867	(1990) Nitrite-Nitrate in Water

ASTM E-329	(1995; Rev. C) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
FS SS-S-1614	(Rev. A) Sealants, Joint, Jet-Fuel-Resistant, Hot-Applied, for Portland Cement and Tar Concrete Pavements

1.2 DEFINITIONS

- a. "Blending size" is an aggregate that complies with the quality requirements in ASTM C-33 and paragraph entitled "Aggregates" and as modified herein and can be blended with coarse and fine aggregate to produce a well graded combined grading.
- b. "Cementitious material" as used herein shall include portland cement, pozzolan, fly ash, ground granulated blast-furnace slag, and [silica fume].
- c. "Design strength" (f'_c) is the specified compressive strength of concrete to meet structural design criteria.
- d. "Marine concrete" is that concrete that will be in contact with or subject to submersion, tidal variations, splash, or spray from water in navigable waterways.
- e. "Mixture proportioning" is a description of the proportions of a concrete mixture that were selected to enable it to meet the performance durability requirements, constructability requirements, and the initial and life-cycle cost goals.
- f. "Mixture proportions" is the concrete supplier's by-mass proportions to replicate the mixture design.
- g. "Pozzolan" is a silicious or silicious and aluminous material, which in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties.
- h. "Field test strength" (f_{cr}) is the required compressive strength of concrete to meet structural and durability criteria. Determine (f_{cr}) during mixture proportioning process.

1.3 SUBMITTALS

Submit the following:

SD-02 Shop Drawings

Reinforcing steel
Formwork
Construction joints
SD-05 Design Data
Mixture design

1.4 MODIFICATION OF REFERENCES

Accomplish work in accordance with ACI publications except as modified herein. Consider the advisory or recommended provisions to be mandatory, as though the word "shall" had been substituted for the words "should" or "could" or "may," wherever they appear. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Foster Wheeler Environmental Site Engineer.

1.5 DELIVERY, STORAGE, AND HANDLING

Do not deliver concrete until vapor barrier, forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement. ACI 301 and ASTM A-934/A 934M for job site storage of materials. Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground. Protect materials from contaminants such as grease, oil, and dirt. Ensure materials can be accurately identified after bundles are broken and tags removed.

1.6 QUALITY ASSURANCE

1.6.1 Concrete Mixture Design

At least 30 days prior to concrete placement, submit proportions for a concrete mixture for each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement, aggregate, fly ash, (or slag pozzolans), silica fume, ground slag, polypropylene fibers, anti-washout and other admixtures for underwater concreting, corrosion inhibitors; and applicable reference specifications. Submit additional data regarding concrete aggregates if the source of aggregate changes. Submittal shall clearly indicate where each mixture will be used when more than one mix design is submitted. An identical concrete mixture previously approved within the past 12 months by EFANW may be used without further approval, if copies of the previous approval and aggregate, fly ash, silica fume, and pozzolan test results are submitted. The approval of aggregate, fly ash, silica fume, and pozzolan[, and polypropylene fibers] tests

results shall have been within 6 months of submittal date. Obtain acknowledgement of receipt prior to concrete placement.

1.6.2 Drawings

1.6.2.1 Reinforcing Steel

ACI 315. Provide bending and cutting diagrams, assembly diagrams, splicing placement and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars. Only complete drawings will be accepted.

1.6.2.2 Formwork

ACI 347R. Include design calculations indicating arrangement of forms, sizes and grades of supports (lumber), panels, and related components. Indicate placement schedule, construction, and location and method of forming control joints. Include locations of inserts, pipework, conduit, sleeves, and other embedded items. Furnish drawings and descriptions of shoring and reshoring methods proposed for slabs, beams, and other horizontal concrete members.

1.6.3 Certificates

1.6.3.1 Curing Concrete Elements

Submit proposed materials and methods for curing concrete elements.

1.6.3.2 Quality Assurance

Develop and submit for approval a quality control plan in accordance with the guidelines of ACI 121R and as specified herein. The plan shall include plans for the concrete supplier, the reinforcing steel supplier, and installer. Maintain a copy of ACI SP-15 and CRSI Manual of Practice at the project site.

1.6.3.3 Field Testing Technician and Testing Agency

Submit data on qualifications of proposed testing agency for approval by the Contracting Officer prior to performing any work.

- a. Work on concrete under this contract shall be performed by an ACI Concrete Field Testing Technician Grade 1 or Grade 2 qualified in accordance with ACI SP-2 or equivalent. Equivalent certification programs shall include requirements for written and performance examinations as stipulated in ACI SP-2.

- b. Testing agencies that perform testing services on reinforcing steel shall meet the requirements of ASTM E-329.
- c. Testing agencies that perform testing services on concrete materials shall meet the requirements of ASTM C-1077.

1.6.3.4 Mixture Designs

Provide a detailed report of materials and methods used, test results, and the field test strength (fcr) for marine concrete required to meet durability requirements.

2.0 PRODUCTS

2.1 CONCRETE

2.1.1 Durability and Strength

ACI 201.2R and ACI 211.1. For structural elements to be exposed in a marine environment, adjust the concrete 28-day design strength to produce concrete of minimum design strength (f'_c) of 5000 psi. [For elements subject to severe abrasion, the minimum design strength (f'_c) will be adjusted to 6000 psi.]

2.1.2 Contractor-Furnished Mixture Proportions

- a. Strength and Water-Cementitious Materials Ratio. Strength requirements shall be based on 28-day compressive strength determined on 6 by 12 inch cylindrical specimens in accordance with ASTM C-39. The specified compressive strength of the concrete (f'_c) for each portion of the structure shall meet the requirements in the contract documents.
- b. The mixture proportions for marine concrete shall be developed by the Subcontractor to produce the design strength (f'_c) and to provide durability, workability, and mixture consistency to facilitate placement, compaction into the forms and around reinforcement without segregation or bleeding. The requirements for durability consideration specified in Table 1 and subparagraph "f" below shall be incorporated in the mixture proportions.

Table 1 - Concrete Quality Requirements

Zone	Exposure Condition	Maximum W/CM	Minimum Quantity of Cementitious Material (lb/yd ³)	Minimum Quantity of Portland Cement (lb/yd ³)
Submerged (1) and tidal (2)	(a) Directly exposed to saltwater	0.40	675	505
	(b) Subject to severe abrasion	0.40	675	505
Splash (3)	(a) Directly exposed to saltwater	0.40	675	505
Atmospheric (4)	(a) Directly exposed to marine atmosphere	0.40	675	505
	(b) Protected from direct exposure to marine atmosphere	0.45	607	505

- c. The maximum mass of fly ash, natural pozzolans, ground granulated blast-furnace slag, or silica fume that is included in the calculation of water-to-cementitious materials ratio shall not exceed the following limits:
- (1) Fly ash shall not be used for more than 25 percent by mass of the cementitious material. The fly ash and other pozzolans present in a Type IP or IPM blended cement, ASTM C-595, shall be included in the calculated percentage. If fly ash or other pozzolan is used in concrete with slag, the portland cement shall not be less than 50 percent of the total mass of cementitious materials. A higher percentage of fly ash may be used if tests are made using actual job materials to ascertain the early and later age strengths and durability performance specified, and the use is approved by the Contracting Officer.
 - (2) The weight of ground granulated blast-furnace slag conforming to ASTM C-989 shall not exceed 50 percent of the weight of cement. The slag used in manufacture of a Type IS or ISM blended hydraulic cement conforming to ASTM C-595 shall be included in the calculated percentage. Higher percentage of ground granulated blast-furnace slag may be used if tests are made using actual job materials to ascertain the early and later age strengths and durability performance specified, and the use is approved by the owner.
 - (3) The maximum silica fume content shall not exceed 10 percent by mass of the cementitious material. The silica fume shall originate from the manufacture of silicon metal and ferro-silicon alloys. A high-range water reducer shall be used with silica fume for proper dispersion of the silica fume.
 - (4) The minimum amount of portland cement is 50 percent of the total mass of cementitious material.
- d. Air Content. Concrete that will be subject to destructive exposure (other than loading and wear in a passive environment) such as freezing and thawing, severe weathering, or deicing chemicals shall be air entrained and shall conform to the air limits specified in ACI 301.
- e. Slump. The concrete mixture shall be proportioned to have, at the point of deposit, a maximum slump of 4 inches as determined by ASTM C-143. Where an ASTM C-494, Type F or G admixture is used, the slump after the addition of the admixture shall be no less than 6 inches nor greater than 8 inches. Slump tolerances shall comply with the requirements of ACI 117.
- f. Chloride Ion Penetration. To ensure the durability of concrete in marine environment, concrete shall be proportioned to have the chloride ion penetration test in accordance with ASTM C-1202, and be below 750 coulombs for concrete specimens tested at 28 days.

2.1.3 Required Average Strength of Concrete

The minimum compressive strength (fcr) of the selected mixture shall equal or exceed the strength required under ACI 301 for laboratory mixture designs and which passes the test indicated in the subparagraph entitled "Chloride Ion Penetration." The average compressive strength produced under field tests shall be the minimum compressive strength (fcr) required during construction.

2.2 MATERIALS

2.2.1 Cement

ASTM C-150, Type I or II and/or ASTM C-595, Type IP(MS) or IS(MS) and ASTM C-1157, Type MS blended cement except as modified herein. The tricalcium aluminate (C3A) content shall not be less than 4 percent to provide protection for the reinforcement and shall not be more than 10 percent to obtain concrete that is resistant to sulfate attack. Blended cements shall consist of a mixture of ASTM C-150 cement and one of the following materials: ASTM C-618 pozzolan or fly ash, or ASTM C-989 ground granulated blast-furnace slag. Use one manufacturer for each type of cement, ground slag, fly ash, and pozzolan.

2.2.1.1 Fly Ash and Pozzolan

ASTM C-618, Type N, F, or C, except that the maximum allowable loss on ignition shall be 6 percent for Types N and F. Add with cement.

2.2.1.2 Ground Iron Blast-Furnace Slag

ASTM C-989, Grade 120.

2.2.1.3 Silica Fume

ASTM C-1240.

2.2.2 Water

Water shall comply with the requirements of ASTM C-94 and the chloride and sulfate limits in accordance with ASTM D-512 and ASTM D-516. Mixing water shall not contain more than 500 parts per million of chlorides as Cl and not more than 100 parts per million of sulfates as SO₄. Water shall be free from injurious amounts of oils, acids, alkalies, salts, and organic materials. Where water from reprocessed concrete is proposed for use in the work, submit results of tests to verify that the treatment has negated adverse effects of deleterious materials.

2.2.3 Aggregates

ASTM C-33, except as modified herein.

- a. The combined aggregates in the mixture (coarse, fine, and blending sizes) shall be well graded from the coarsest to the finest with not more than 18 percent nor less than 8 percent, unless otherwise permitted, of the combined aggregate retained on any individual sieve with the exceptions that the No. 50 may have less than 8 percent retained, sieves finer than No. 50 shall have less than 8 percent retained, and the coarsest sieve may have less than 8 percent retained. Use blending sizes where necessary, to provide a well graded combined aggregate. Reports of individual aggregates shall include standard concrete aggregate sieve sizes including 1 1/2 inches, one inch, 3/4 inch, 1/2 inch, 3/8 inch, No. 4, No. 8, No. 16, No. 30, No. 50, and No. 100.
- b. Provide aggregates for exposed concrete from one source, ASTM C-227. Do not provide aggregates that react deleteriously with alkalis in cement. Refer to appendix, paragraph entitled "Test Method C227" of ASTM C-33 for expansion limits. Provide aggregate containing no deleterious material properties as identified by ASTM C-295.
- c. Where a size designation is indicated, that designation indicates the nominal maximum size of the coarse aggregate.
- d. Aggregate may contain materials deleteriously reactive with alkalis in the cement, if cement contains less than 0.60 percent alkalis (percent Na₂O plus .658 percent K₂O). Provide a material such as fly ash, slag, or silica fume as specified to be effective in preventing harmful expansion due to alkali-aggregate reaction by ASTM C-441.
- e. Where historical data is used, provide aggregates from the same sources having the same size ranges as those used in the concrete represented by historical data.
- f. Marine aggregate may be used when conforming to ASTM C-33 and if it originates from the up-current side of the land mass and it has been washed by the fresh water so that the total chloride and sulfate content of the concrete mixture does not exceed the limits defined herein.

2.2.4 Nonshrink Grout

ASTM C-1107.

2.2.5 Admixtures

- a. Provide chemical admixtures that comply with the requirements shown below and in accordance with manufacturer's recommendations, and appropriate for the climatic conditions and the construction needs. Do not use calcium chloride or admixtures containing chlorides from other than impurities from admixture ingredients.

- b. Provide minimum concentrations of corrosion-inducing chemicals as shown in Table 2 below. For concrete that may be in contact with prestressing steel tendons, the concentration shall not exceed 60 percent of the limits given in Table 2. For the concentration in grout for prestressing ducts, do not exceed 25 percent of the limits in Table 2.

Table 2 - Limits on Corrosion-Inducing Chemicals

Chemical*	Limits (Percent)**	Test Method
Chlorides	0.10	ASTM D-512
Fluorides	0.10	ASTM D-1179
Sulphites	0.13	ASTM D-1339
Nitrates	0.17	ASTM D-3867

* Limits refer to water-soluble chemicals

** Limits are expressed as a percentage of the mass of the total cementitious materials.

- c. Provide anti-washout admixtures for underwater placement with a proven record of performance and compatible with the chosen cement.
- d. The total alkali content shall not increase the total sodium-oxide equivalent alkali content of the concrete by more than 0.5 lb/yd³.

2.2.5.1 Air Entraining Admixture

Provide air entraining admixtures conforming to ASTM C-260. Provide the admixture of such a type and dosage that the total air content in the hardened concrete can be readily maintained within the limits specified in Table 3.

Table 3 - Air Content

Nominal maximum size of coarse aggregate, inch(es)	Size Number	Total air content, percent by volume
3/8	8	6-10
1/2	7	5-9
3/4	67	4-8
1	57	3.5-6.5
1 1/2	467	3-6
2	357	2.5-5.5
3	-	1.5-4.5

2.2.5.2 Accelerating

ASTM C-494, Type C.

2.2.5.3 Retarding

ASTM C-494, Type B, D, or G.

2.2.5.4 Water Reducing

ASTM C-494, Type A, E, or F.

2.2.5.5 High Range Water Reducer (HRWR)

ASTM C-494, Type F and ASTM C-1017.

2.2.6 Materials for Forms

Provide wood, plywood, or steel. Use plywood or steel forms where a smooth form finish is required. Lumber shall be square edged or tongue-and-groove boards, free of raised grain, knotholes, or other surface defects. Plywood: PS-1, B-B concrete form panels or better. Steel form surfaces shall not contain irregularities, dents, or sags.

2.2.6.1 Form Ties and Form-Facing Material

- a. Provide a form tie system that does not leave mild steel after break-off or removal any closer than 2 inches from the exposed surface. Do not use wire alone. Form ties and accessories shall not reduce the effective cover of the reinforcement.
- b. Form-facing material shall be structural plywood or other material that can absorb air trapped in pockets between the form and the concrete and some of the high water-cementitious materials ratio surface paste. Maximum use is three times. Provide forms with a form treatment to prevent bond of the concrete to the form.
- c. As an alternate to using an absorptive wood form contact face as a form liner, use "Zendrain" or an approved equal in strict accordance with the manufacturer's recommendations.

2.2.7 Reinforcement

2.2.7.1 Reinforcing Bars

ACI 301 unless otherwise specified. ASTM A-615/A 615M and ASTM A-617/A 617M with the bars marked A, Grade 40; or ASTM A-616/A 616M with the bars marked R,

Grade 50. Prefabricated epoxy coated, ASTM A-934/A 934M. Do not use uncoated reinforcing steel.

2.2.8 Materials for Curing Concrete

2.2.8.1 Impervious Sheeting

ASTM C-171; waterproof paper, clear or white polyethylene sheeting, or polyethylene-coated burlap.

2.2.8.2 Pervious Sheeting

AASHTO M182.

2.2.8.3 Liquid Membrane-Forming Compound

ASTM C-309, white-pigmented, Type 2, Class B.

2.2.9 Epoxy Bonding Compound

ASTM C-881. Provide Type I for bonding hardened concrete to hardened concrete; Type II for bonding freshly mixed concrete to hardened concrete; and Type III as a binder in epoxy mortar or concrete, or for use in bonding skid-resistant materials to hardened concrete. Provide Grade 1 or 2 for horizontal surfaces and Grade 3 for vertical surfaces. Provide Class A if placement temperature is below 40 degrees F; Class B if placement temperature is between 40 and 60 degrees F; or Class C if placement temperature is above 60 degrees F.

2.2.10 Dovetail Anchor Slot

Provide preformed metal slot approximately one by one inch minimum 22 gage galvanized steel. Coordinate size and throat opening with dovetail anchors. Provide with removable filler material.

3.0 EXECUTION

3.1 FORMS

- a. ACI 301. [Concrete for footings may be placed in excavations without forms upon inspection and approval by the Contracting Officer. Excavation width shall be a minimum of 4 inches greater than indicated.] Set forms mortar-tight and true to line and grade. Chamfer above grade exposed joints, edges, and external corners of

concrete 0.75 inch unless otherwise indicated. Forms submerged in water shall be watertight.

- b. Provide formwork with clean-out openings to permit inspection and removal of debris. Formwork shall be gasketed or otherwise rendered sufficiently tight to prevent leakage of paste or grout under heavy, high-frequency vibration. Use a release agent that does not cause surface dusting. Limit reuse of plywood to no more than three times. Reuse may be further limited by the Contracting Officer if it is found that the pores of the plywood are clogged with paste to the degree that the wood does not absorb the air or the high water-cementitious materials ratio concrete surface.
- c. Patch form tie holes with a nonshrink patching material in accordance with the manufacturer's recommendations and subject to approval.

3.1.1 Coating

Before concrete placement, coat the contact surfaces of forms with a nonstaining mineral oil, nonstaining form coating compound, or two coats of nitrocellulose lacquer. Do not use mineral oil on forms for surfaces to which adhesive, paint, or other finish material is to be applied.

3.1.2 Removal of Forms and Supports

After placing concrete, forms shall remain in place for the time periods specified in ACI 347R, except for concrete placed underwater, forms shall remain in place 48 hours. Prevent concrete damage during form removal.

3.1.2.1 Special Requirements for Reduced Time Period

Forms may be removed earlier than specified if ASTM C-39 test results of field-cured samples from a representative portion of the structure or other approved and calibrated non-destructive testing techniques show that the concrete has reached a minimum of 85 percent of the design strength.

3.1.3 Reshoring

Do not allow construction loads to exceed the superimposed load which the structural member, with necessary supplemental support, is capable of carrying safely and without damage. Reshore concrete elements where forms are removed prior to the specified time period. Do not permit elements to deflect or accept loads during form stripping or reshoring. Forms on columns, walls, or other load-bearing members may be stripped after 2 days if loads are not applied to the members. After forms are removed, slabs and beams over 10 feet in span and cantilevers over 4 feet shall be reshored for the remainder of the specified time period in accordance with paragraph entitled "Removal of Forms."

Perform reshoring operations to prevent subjecting concrete members to overloads, eccentric loading, or reverse bending. Reshoring elements shall have the same load-carry capabilities as original shoring and shall be spaced similar to original shoring. Firmly secure and brace reshoring elements to provide solid bearing and support.

3.2 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

ACI 301. Remove rust, scale, oil, grease, clay, or foreign substances from reinforcing that would reduce the epoxy coating bond from reinforcing. Do not tack weld. Inspect placed steel reinforcing for coating damage prior to placing concrete. Repair all visible damage.

3.2.1 Epoxy Coated Reinforcing

Shall meet the requirements of ASTM A-934/A 934M including Appendix X2, "Guidelines for Job Site Practices" except as otherwise specified herein.

3.2.1.1 Epoxy Coated Reinforcing Steel Delivery, Handling, and Storage

Record coating lot on each shipping notice and carefully identify and retag bar bundles from bending plant. Provide systems for handling coated bars which have padded contact areas, nylon slings, etc., all free of dirt and grit. Lift bundled coated bars with strong back, multiple supports, or platform bridge to prevent sagging and abrasion. Bundling bands shall be padded where in contact with bars. Do not drop or drag bars or bundles. Store coated bars both in shop and in field, aboveground, on wooden or padded cribbing. Space the dunnage close enough to prevent excessive sags. Stack large quantities of straight bars with adequate protective blocking between layers. Schedule deliveries of epoxy coated bars to the job site to avoid the need for long term storage. Protect from direct sunlight and weather. Bars to be stored longer than 12 hours at the job site shall be covered with opaque polyethylene sheeting or other suitable equivalent protective material.

3.2.1.2 Epoxy Coated Steel Reinforcing Steel Placement and Coating Repair

Carefully handle and install bars to minimize job site patching. Use the same precautions as described above for delivery, handling, and storage when placing coated reinforcement. Do not drag bars over other bars or over abrasive surfaces. Keep bar free of dirt and grit. When possible, assemble reinforcement as tied cages prior to final placement into the forms. Support assembled cages on padded supports. It is not expected that coated bars, when in final position ready for concrete placement, will be completely free of damaged areas; however, excessive nicks and scrapes which expose steel will be cause for rejection. Criteria for defects which require repair and for those that do not require repair are as indicated. Inspect for defects and provide required repairs prior to assembly. After assembly, reinspect and provide final repairs.

- a. Immediately prior to application of the patching material, any rust and debonded coating shall be manually removed from the reinforcement by suitable techniques

employing devices such as wire brushes and emery paper. Care shall be exercised during this surface preparation so that the damaged areas are not enlarged more than necessary to accomplish the repair. Damaged areas shall be clean of dirt, debris, oil, and similar materials prior to application of the patching material.

- b. Repair and patching shall be done in accordance with the patching material manufacturer's recommendations. These recommendations, including cure times, shall be available at the job site at all times.
- c. Allow adequate time for the patching materials to cure in accordance with the manufacturer's recommendation prior to concrete placement.
- d. Rinse placed reinforcing bars with fresh water to remove chloride contamination prior to placing concrete.

3.2.2 Reinforcement Supports

Place reinforcement and secure with noncorrodible chairs, spacers, or metal hangers. Support reinforcement on the ground with concrete or other noncorrodible material, having a compressive strength equal to or greater than the concrete being placed. ASTM A-934/A 934M. Epoxy-coated reinforcing bars supported from formwork shall rest on coated wire bar supports, or on bar supports made of dielectric material or other acceptable material. Wire bar supports shall be coated with dielectric material, compatible with concrete, for a minimum distance of 2 inches from the point of contact with the epoxy-coated reinforcing bars. Reinforcing bars used as support bars shall be epoxy coated. Spreader bars, where used, shall be epoxy coated. Proprietary combination bar clips and spreaders used in construction with epoxy-coated reinforcing bars shall be made corrosion resistant or coated with dielectric material. Epoxy-coated bars shall be tied with plastic-coated tie wire; or other materials acceptable to the Contracting Officer.

3.2.3 Splicing

As indicated. For splices not indicated, ACI 301.

3.2.4 Cover

Concrete cover for reinforcement is shown in Table 4. Placement tolerance is plus 1/4 inch. The cover to the principle reinforcing bars shall be not less than 2 times the nominal maximum aggregate size nor less than 1.5 times the effective diameter of the reinforcing bars.

Table 4 - Minimum Concrete Cover Over Reinforcement

Zone	Cover over post-tensioning ducts	
	Cover over reinforcing steel	
Atmospheric zone not subject to salt spray	2.5 in.	3 in.
Tidal, splash, and atmospheric zone subject to salt spray	3.0 in.	3.5 in.
Submerged zone	2.5 in.	3 in.
Cover of stirrups	1/2 in.	-

less than those listed above

3.2.5 Setting Miscellaneous Material and Prestress Anchorages

Place and secure anchors, bolts, pipe sleeves, conduits, and other such items in position before concrete placement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete. Electrically isolate exposed steel work and its anchor systems from the primary steel reinforcement with at least 2 inches of concrete. Coat exposed steel work to reduce corrosion. Take particular care to ensure against corrosion on edges and horizontal surfaces. Use epoxy coatings for protection of carbon steel plates and fittings.

3.2.6 Construction Joints

Locate joints to least impair strength. Continue reinforcement across joints unless otherwise indicated.

3.2.7 Expansion Joints and Contraction Joints

Provide expansion joint at edges of interior floor slabs on grade abutting vertical surfaces, and as indicated. Make expansion joints 1/2 inch wide unless indicated otherwise. Fill expansion joints not exposed to weather with preformed joint filler material. Completely fill joints exposed to weather with joint filler material and joint sealant. Do not extend reinforcement or other embedded metal items bonded to the concrete through any expansion joint unless an expansion sleeve is used. Place contraction joints, either formed or saw cut or cut with a jointing tool, to the indicated depth after the surface has been finished. Sawed joints shall be completed within 4 to 12 hours after concrete placement. Protect joints from intrusion of foreign matter.

3.3 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

ASTM C-94, ACI 301, and ACI 304R, except as modified herein. Batching equipment shall be such that the concrete ingredients are consistently measured within the following tolerances: 1 per cent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch tickets imprinted with mix identification, batch size, batch design and measured weights, moisture in the aggregates, and time batched for each load of ready mix concrete. When a pozzolan is batched cumulatively with the cement, it shall be batched after the cement has entered the weight hopper.

3.3.1 Measuring

Make measurements at intervals as specified in paragraphs entitled "Sampling" and "Testing."

Adjust batch proportions to replicate the mixture design using methods provided in the approved quality assurance plan. Base the adjustments on results of tests of materials at the batch plant for use in the work. Maintain a full record of adjustments and the basis for each.

3.3.2 Mixing

ASTM C-94 and ACI 301. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates if the air temperature is less than 85 degrees F. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 85 degrees F except as follows: if set retarding admixture is used and slump requirements can be met, limit for placing concrete may remain at 90 minutes. Additional water may be added, if both the specified maximum slump and water-cementitious material ratio are not exceeded. When water is added, an additional 30 revolutions of the mixer at mixing speed is required. If time of discharge exceeds time required by ASTM C-94, submit a request along with description of precautions to be taken. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch.

3.3.3 Transporting

Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.4 PLACING CONCRETE

Place concrete as soon as practicable after the forms and the reinforcement have been inspected and approved. Do not place concrete when weather conditions prevent proper

placement and consolidation; in uncovered areas during periods of precipitation; or in standing water. Prior to placing concrete, remove dirt, construction debris, water, snow, and ice from within the forms. Deposit concrete as close as practicable to the final position in the forms. Do not exceed a free vertical drop of 3 feet from the point of discharge. Place concrete in one continuous operation from one end of the structure towards the other or lifts for vertical construction. Position grade stakes on 10 foot centers maximum in each direction when pouring interior slabs and on 20 foot centers maximum for exterior slabs.

3.4.1 Vibration

Comply with the requirements of ACI 309R and ASTM A-934/A 934M using vibrators with a minimum frequency of 9000 vibrations per minute (VPM). Use only high cycle or high frequency vibrators. Motor-in-head 60 cycle vibrators may not be used. For walls and deep beams, use a minimum of two vibrators with the first to melt down the mixture and the second to thoroughly consolidate the mass. Provide a spare vibrator at the casting site whenever concrete is placed. Place concrete in 18 inch maximum vertical lifts. Insert and withdraw vibrators approximately 18 inches apart. Penetrate at least 8 inches into the previously placed lift with the vibrator when more than one lift is required. Extract the vibrator using a series of up and down motions to drive the trapped air out of the concrete and from between the concrete and the forms.

For slab construction use vibrating screeds designed to consolidate the full depth of the concrete. Where beams and slabs intersect, use an internal vibrator to consolidate the beam. Do not vibrate concrete placed with anti-washout admixtures. Vibrators shall be equipped with rubber vibrator heads.

3.4.2 Application of Epoxy Bonding Compound

Apply a thin coat of compound to dry, clean surfaces. Scrub compound into the surface with a stiff-bristle brush. Place concrete while compound is tacky. Do not permit compound to harden prior to concrete placement. Follow manufacturer's instructions regarding safety and health precautions when working with epoxy resins.

3.4.3 Cold Weather

ACI 306.1. Do not allow concrete temperature to decrease below 50 degrees F. Obtain approval prior to placing concrete when ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and provide sufficient heat to maintain 50 degrees F minimum adjacent to both the formwork and the structure while curing. Limit the rate of cooling to 5 degrees F in any one hour and 50 degrees F per 24 hours after heat application.

3.4.4 Hot Weather

ACI 305R. Maintain required concrete temperature using Figure 2.1.5, "Effect of Concrete Temperatures, Relative Humidity, and Wind Velocity on the Rate of Evaporation of Surface Moisture From Concrete" in ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

3.5 SURFACE FINISHES EXCEPT FLOOR, SLAB, AND PAVEMENT

3.5.1 Defects

Repair formed surfaces by removing minor honeycombs, pits greater than one square inch surface area or 0.25 inch maximum depth, or otherwise defective areas. Provide edges perpendicular to the surface and patch with nonshrink grout. Patch tie holes and defects when the forms are removed. Concrete with extensive honeycomb including exposed steel reinforcement, cold joints, entrapped debris, separated aggregate, or other defects which affect the serviceability or structural strength will be rejected, unless correction of defects is approved. Obtain approval of corrective action prior to repair. The surface of the concrete shall not vary more than the allowable tolerances of ACI 347R. Exposed surfaces shall be uniform in appearance and finished to a smooth form finish unless otherwise indicated.

3.5.2 Not Against Forms (Top of Walls)

Finish surfaces not otherwise specified with wood floats to even surfaces, and match adjacent finishes.

3.5.3 Formed Surfaces

3.5.3.1 Tolerances

ACI 117 and as indicated.

3.5.3.2 As-Cast Rough Form

Provide for surfaces not exposed to public view. Patch holes and defects and level abrupt irregularities. Remove or rub off fins and other projections exceeding 0.25 inch in height.

3.5.3.3 As-Cast Form

Provide form facing material producing a smooth, hard, uniform texture on the concrete. Arrange facing material in an orderly and symmetrical manner and keep seams to a practical minimum. Support forms as necessary to meet required tolerances. Material with raised grain, torn surfaces, worn edges, patches, dents, or other defects which will impair the texture of the concrete surface shall not be used. Patch tie holes and defects and completely remove fins.

3.6 FINISHES FOR HORIZONTAL CONCRETE SURFACES

3.6.1 Finish

ACI 301. Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater.

3.6.1.1 Scratched

Use for surfaces intended to receive bonded applied cementitious applications. After the concrete has been placed, consolidated, struck off, and leveled, the surface shall be roughened with stiff brushes or rakes before final set.

3.6.1.2 Floated

After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further, until ready for floating. Whether floating with a wood, magnesium, or composite hand float, with a bladed power trowel equipped with float shoes, or with a powered disc, float shall begin when the surface has stiffened sufficiently to permit the operation.

3.6.1.3 Concrete Containing Silica Fume

Finish using magnesium floats or darbies.

3.6.1.4 Broomed

Perform a floated finish, then draw a broom or burlap belt across the surface to produce a coarse scored texture. Permit surface to harden sufficiently to retain the scoring or ridges. Broom transverse to traffic or at right angles to the slope of the slab.

3.7 CURING AND PROTECTION

- a. ACI 301 and ACI 308 unless otherwise specified. Prevent concrete from drying by misting surface of concrete. Begin curing immediately following final set. Avoid damage to concrete from vibration created by blasting, pile driving, movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, by rain or running water, adverse weather conditions, and any other activity resulting in ground vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period. Provide moist curing for those areas receiving liquid chemical sealer-hardener or epoxy coating. [For concrete slabs or wide beams containing silica fume, fog spray and install wind breaks to ensure 100 percent relative humidity until wet curing is started.]
- b. Wet cure marine concrete using potable water for a minimum of 7 days. Do not allow construction loads to exceed the superimposed load which the structural member, with necessary supplemental support, is capable of carrying safely and without damage.

3.7.1 Moist Curing

Remove water without erosion or damage to the structure.

3.7.1.1 Fog Spraying or Sprinkling

Apply water uniformly and continuously throughout the curing period. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

3.7.1.2 Pervious Sheeting

Completely cover surface and edges of the concrete with two thicknesses of wet sheeting. Overlap sheeting 6 inches over adjacent sheeting. Sheeting shall be at least as long as the width of the surface to be cured. During application, do not drag the sheeting over the finished concrete nor over sheeting already placed. Wet sheeting thoroughly and keep continuously wet throughout the curing period.

3.7.1.3 Impervious Sheeting

Wet the entire exposed surface of the concrete thoroughly with a fine spray of water and cover with impervious sheeting throughout the curing period. Lay sheeting directly on the concrete surface and overlap edges 12 inches minimum. Provide sheeting not less than 18 inches wider than the concrete surface to be cured. Secure edges and transverse laps to form closed joints. Repair torn or damaged sheeting or provide new sheeting. Cover or wrap columns, walls, and other vertical structural elements from the top down with impervious sheeting; overlap and continuously tape sheeting joints; and introduce sufficient water to soak the entire surface prior to completely enclosing.

3.7.2 Liquid Membrane-Forming Curing Compound

Seal or cover joint openings prior to application of curing compound. Prevent curing compound from entering the joint. Apply in accordance with the recommendations of the manufacturer immediately after any water sheen which may develop after finishing has disappeared from the concrete surface. Provide and maintain compound on the concrete surface throughout the curing period. Do not use this method of curing where the use of Figure 2.1.5, "effect of Concrete Temperatures, Relative Humidity, and Wind Velocity on the Rate of Evaporation of Surface Moisture From Concrete" in ACI 305R indicates that hot weather conditions will cause an evaporation rate exceeding 0.2 pound of water per square foot per hour.

3.7.2.1 Application

Mechanically agitate curing compound thoroughly during use. Use approved power-spraying equipment to uniformly apply two coats of compound in a continuous operation. The total coverage for the two coats shall be 200 square feet maximum per gallon of undiluted compound unless otherwise recommended by the manufacturer's written instructions. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel. Immediately apply an additional coat of compound to areas where the film is defective. Respray concrete surfaces subjected to rainfall within 3 hours after the curing compound application.

3.7.2.2 Protection of Treated Surfaces

Prohibit pedestrian and vehicular traffic and other sources of abrasion at least 72 hours after compound application. Maintain continuity of the coating for the entire curing period and immediately repair any damage.

3.7.3 Liquid Chemical Sealer-Hardener

Apply the sealer-hardener in accordance with manufacturer's recommendations. Seal or cover joints and openings in which joint sealant is to be applied as required by the joint sealant manufacturer. The sealer-hardener shall not be applied until the concrete has been

moist cured and has aged for a minimum of 30 days. Apply a minimum of two coats of sealer-hardener.

3.7.4 Curing Periods

Moist cure concrete using potable water for a minimum of 7 days. Continue additional curing for a total period of 21 days. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing shall be subject to approval by the Contracting Officer.

3.7.5 Requirements for Type III, High-Early-Strength Portland Cement

The curing periods shall be not less than one-fourth of those specified for portland cement, but in no case less than 72 hours.

3.8 FIELD QUALITY CONTROL

3.8.1 Testing

3.8.1.1 Slump Tests

ASTM C-143. Take concrete samples during concrete placement. The maximum slump may be increased as specified with the addition of an approved high range water reducing (HRWR) admixture provided that the water-cement ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 10 cubic yards (maximum) of concrete.

3.8.1.2 Compressive Strength Tests

ACI 214 tests for strength - conduct strength tests of concrete during construction in accordance with the following procedures:

- a. Mold and cure six 6 by 12 inch cylinders from each sample taken in accordance with ASTM C-31/C 31M. Prevent evaporation and loss of water from the specimen.
- b. Test cylinders in accordance with ASTM C-39. Test one cylinder at 3 days, two cylinders at 7 days, two cylinders at 28 days, and hold one cylinder in reserve. The compressive strength test results for acceptance shall be the average of the compressive strengths from the two specimens tested at 28 days. If one specimen in a test shows evidence of improper sampling, molding or testing, discard the specimen and consider the strength of the remaining cylinder to be the test result. If both specimens in a test show any defects, the Contracting Officer may allow the entire test to be discarded.

- c. If the average of any three consecutive strength test results is less than the specified strength (f'_c) or the minimum test strength (f_{cr}) for durability, whichever is higher, by more the 500 psi, take a minimum of three core samples in accordance with ASTM C-42, from the in-place work represented by the low test results. Locations represented by erratic core strengths shall be retested. Remove concrete not meeting strength criteria and provide new acceptable concrete. Repair core holes with nonshrink grout. Match color and finish of adjacent concrete.
- d. Strength test reports shall include location in the work where the batch represented by a test was deposited, batch ticket number, time batched and sampled, slump, air content (where specified), mixture and ambient temperature, unit weight, and water added on the job. Reports of strength tests shall include detailed information of storage and curing of specimens prior to testing.
- e. Final reports shall be provided within 7 days of test completion.

3.8.1.3 Air Content

ASTM C-173 or ASTM C-231 for normal weight concrete. Where concrete will be exposed to deicing salts as indicated. Make air content tests on samples from the first three batches in the placement and until three consecutive batches have air contents within the range of the specified air content, at which time test every fifth batch. Maintain this test frequency until a batch is not within the specified range at which time resume testing of each batch until three consecutive batches have air contents within the specified range. Perform additional tests as necessary for control. Take air content tests from planned composite samples or from samples taken in accordance with ASTM C-172 at the point of concrete placement.

3.8.2 Acceptance of Concrete Strength

3.8.2.1 Standard Molded and Cured Strength Specimens

When the averages of all sets of three consecutive compressive strength test results equal or exceed the design compressive strength (f'_c) or the required field test strength (f_{cr}) whichever is higher, and no individual strength test falls below the specified compressive strength (f'_c) or the required field durability strength (f_{cr}) by more than 500 psi, whichever is higher. These criteria also apply when accelerated strength testing is specified unless another basis for acceptance is specified.

3.8.2.2 Non-Destructive Tests

Non-destructive tests may be used when permitted to evaluate concrete where standard molded and cured cylinders have yielded results not meeting the criteria.

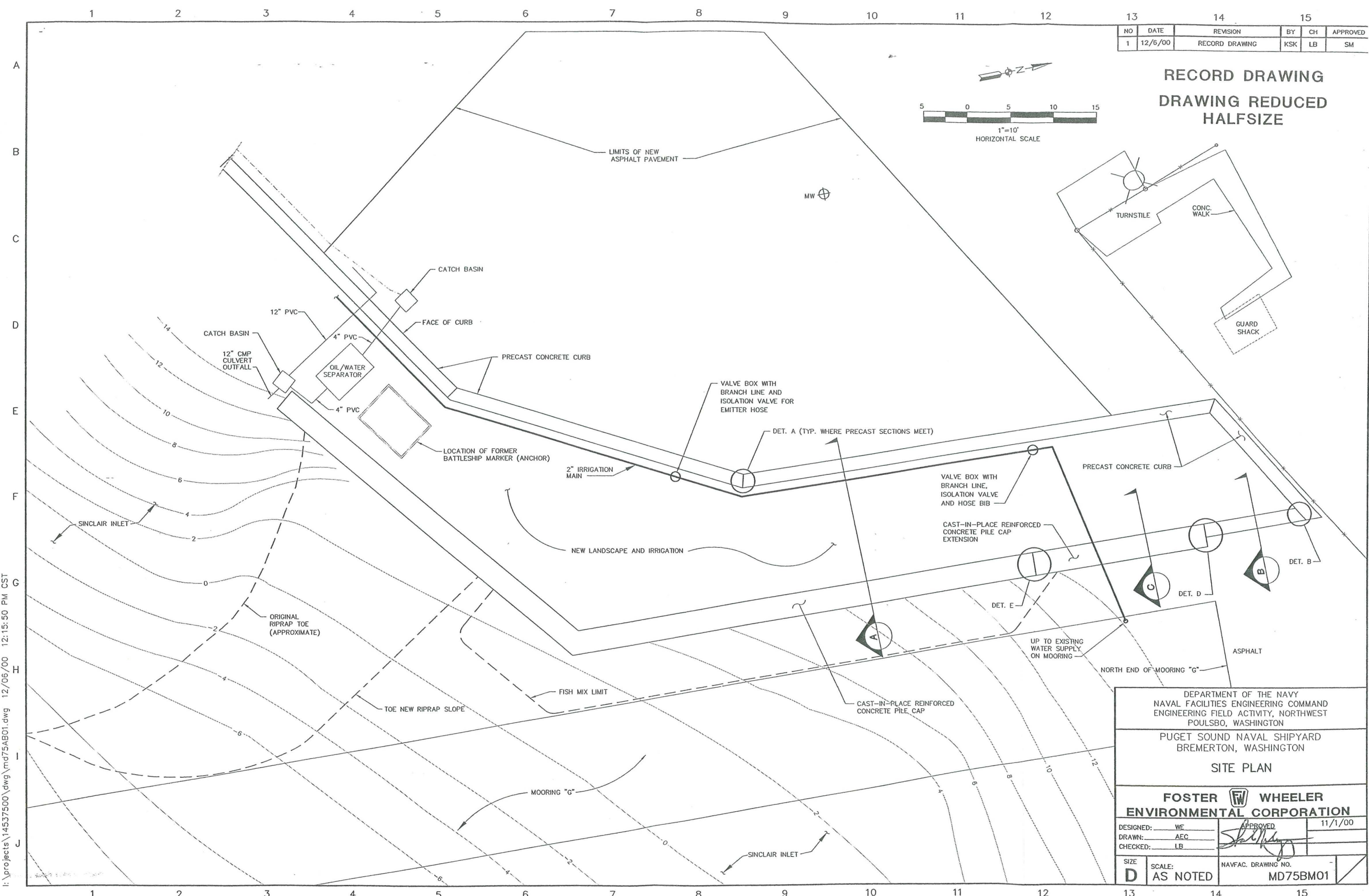
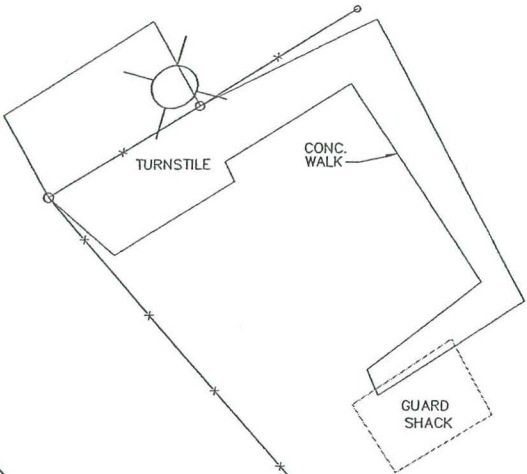
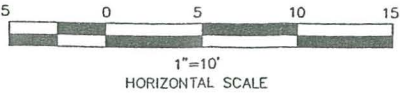
3.8.2.3 Core Tests

When the average compressive strengths of the representative cores are equal to at least 85 percent of the design strength (f_c) or the required average test strength (f_{cr}), whichever is higher, and if no single core is less than 75 percent of the specified strength (f_c) or the required average field test strength (f_{cr}), whichever is higher, strength of concrete is satisfactory.

END OF SECTION

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RECORD DRAWING
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 HALFSIZE



DEPARTMENT OF THE NAVY
 NAVAL FACILITIES ENGINEERING COMMAND
 ENGINEERING FIELD ACTIVITY, NORTHWEST
 POUFSBO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
 BREMERTON, WASHINGTON

SITE PLAN

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

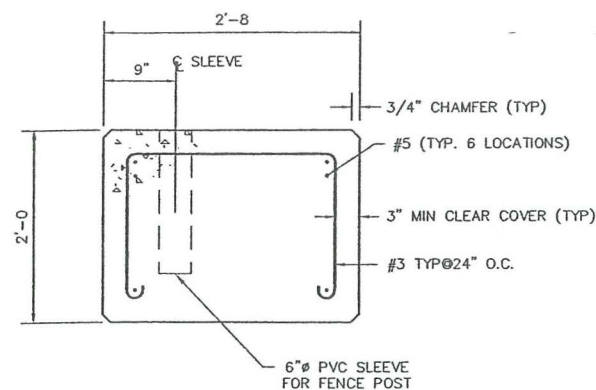
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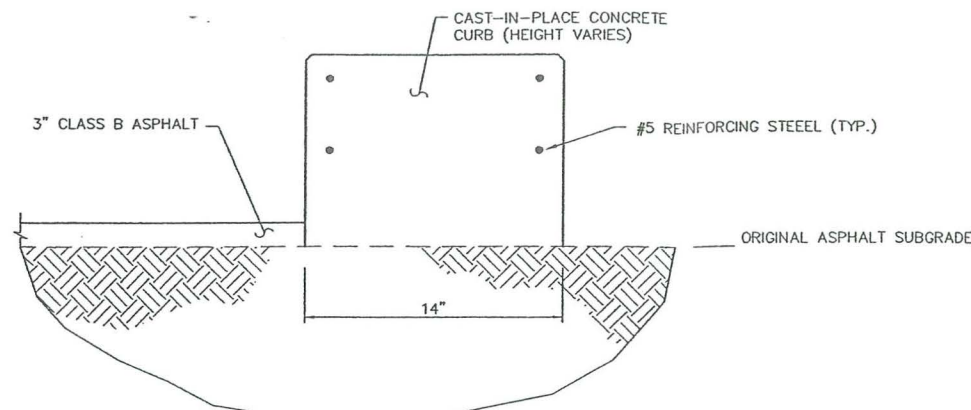
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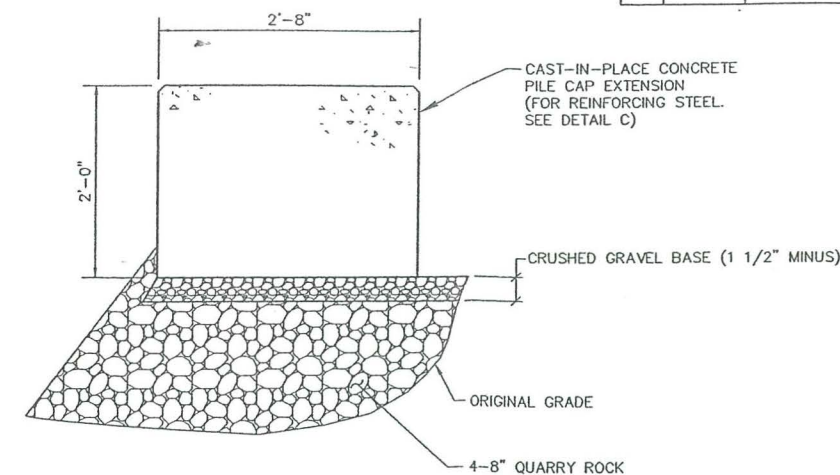


PILE CAP REINFORCING STEEL EPOXY COATED.
REINFORCING STEEL FOR CAP EXTENSION UNCOATED.

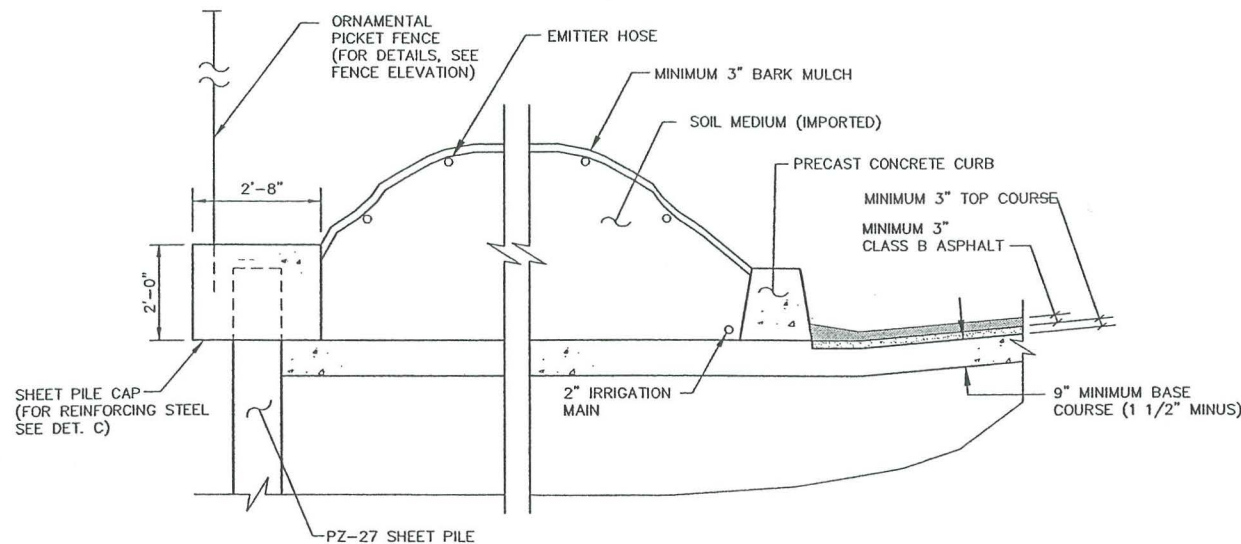
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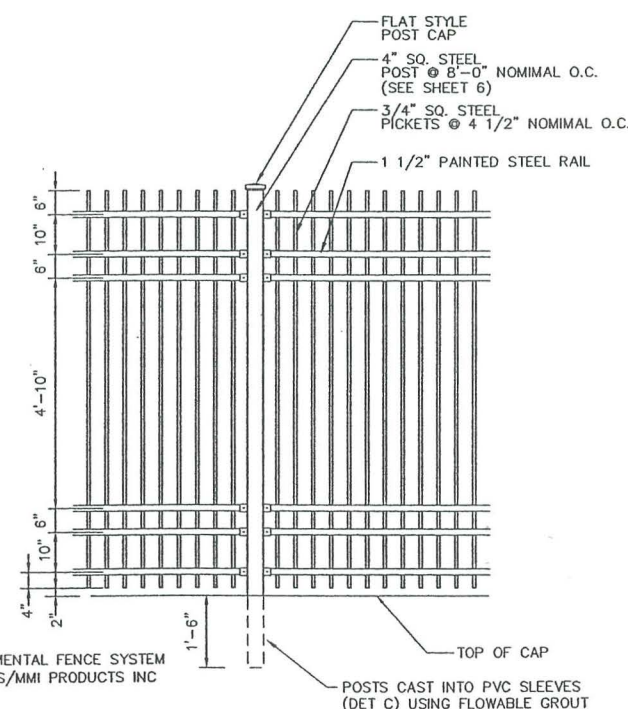
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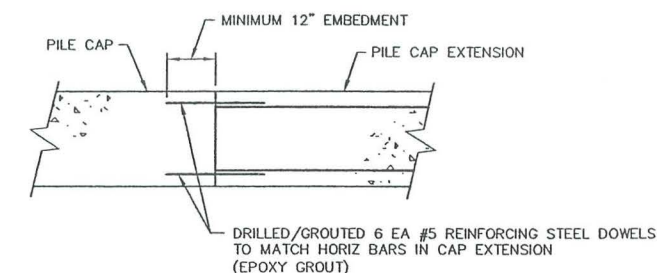
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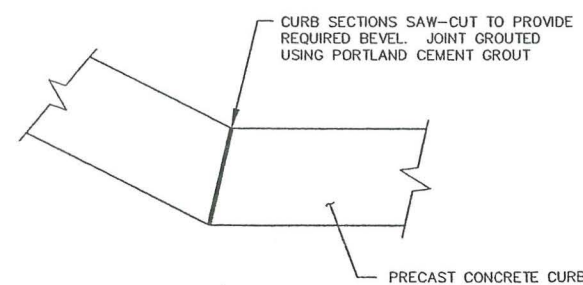
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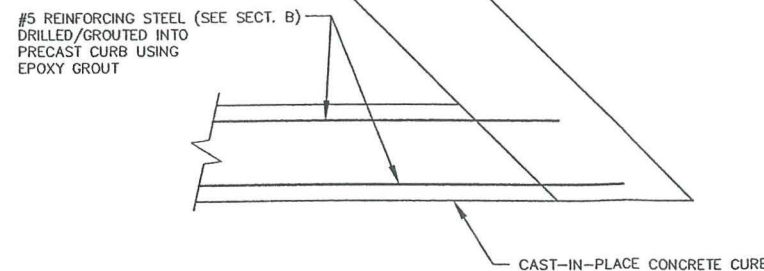
FENCE ELEVATION



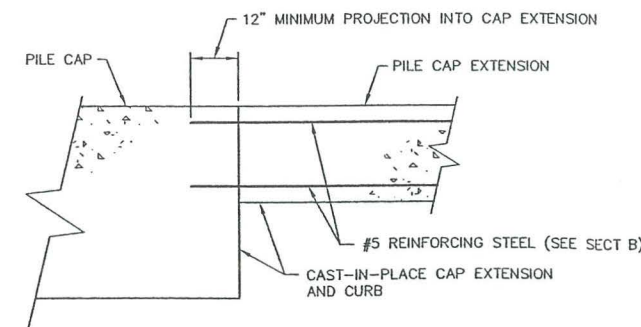
DETAIL E



DETAIL A



DETAIL B



DETAIL D

RECORD DRAWING

**DRAWING REDUCED
HALFSIZE**

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY, NORTHWEST
POULSBORO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON

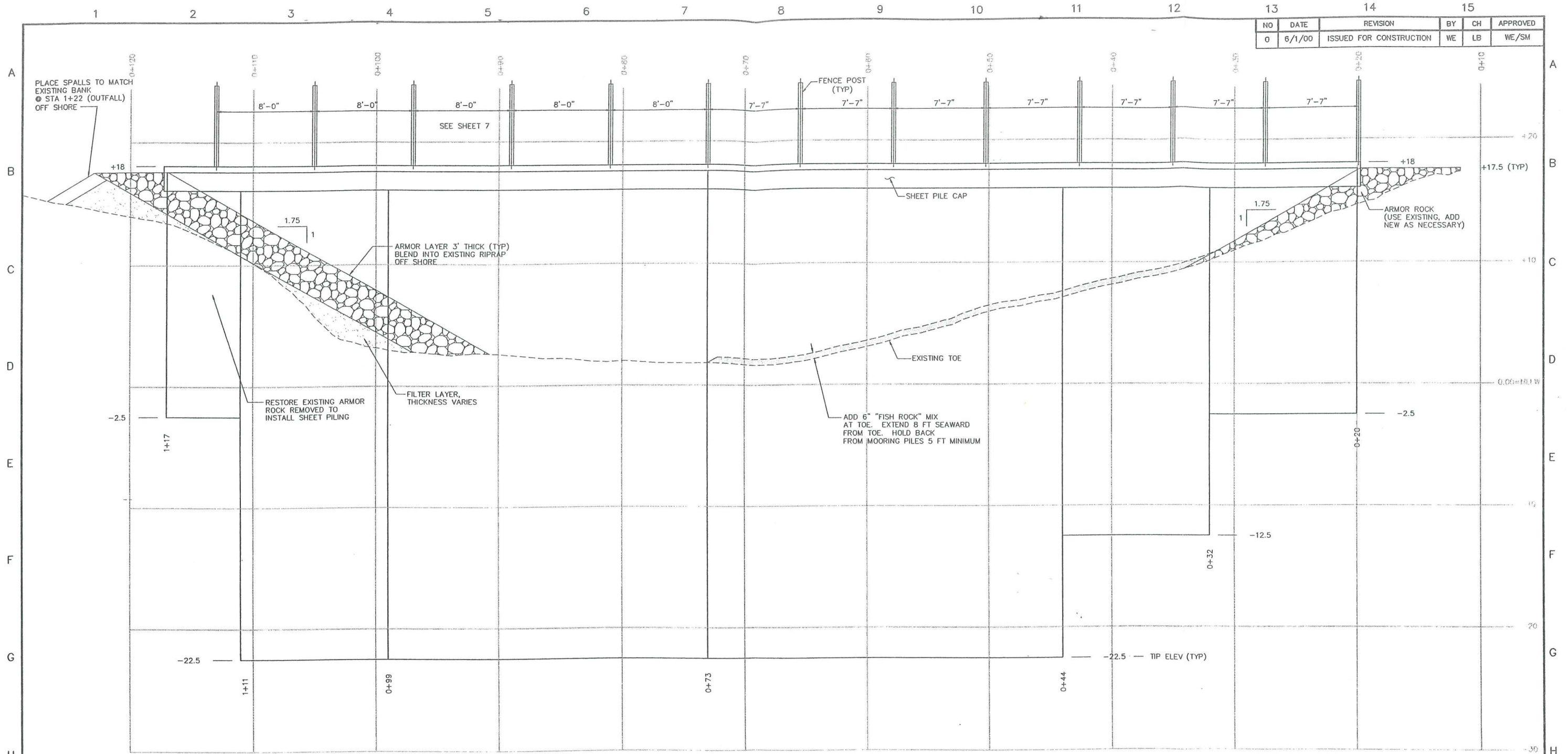
SECTIONS & DETAILS

**FOSTER WHEELER
ENVIRONMENTAL CORPORATION**

DESIGNED: WE
DRAWN: AEC
CHECKED: LB
APPROVED: *[Signature]*
11/1/00

SIZE: D
SCALE: AS NOTED
NAVJAC. DRAWING NO. MD75DT01

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PLOT/UPDATE: MAY 31 2000 16:51:30



ELEVATION VIEW
SCALE: 1/4"=1'

**ISSUED FOR
CONSTRUCTION**
**DRAWING REDUCED
HALFSIZE**



DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON			
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON			
SHEET PILE WALL ELEVATION, D075			
FOSTER WHEELER ENVIRONMENTAL CORPORATION			
DESIGNED: WE	APPROVED: [Signature]	6/1/00	
DRAWN: AEC	CHECKED: LB		
SIZE: D	SCALE: AS NOTED	NAVFAC. DRAWING NO. MD75DT01	6/7

2. Reason for Change

All sheets were driven to design tip elevation except the following:

Sta 0+20 to 0+21.5 (tip elev. -1.6)
Sta 0+42.5 to 0+44 (tip elev. -11.2)
Sta 0+44 to 0+45.5 (tip elev. -20.4)
Sta 0+76.5 to 0+78 (tip elev. -18.2)
Sta 0+88.5 to 0+91.5 (tip elev. -18.5)
Sta 1+06.5 to 1+09.5 (tip elev. -1.3)

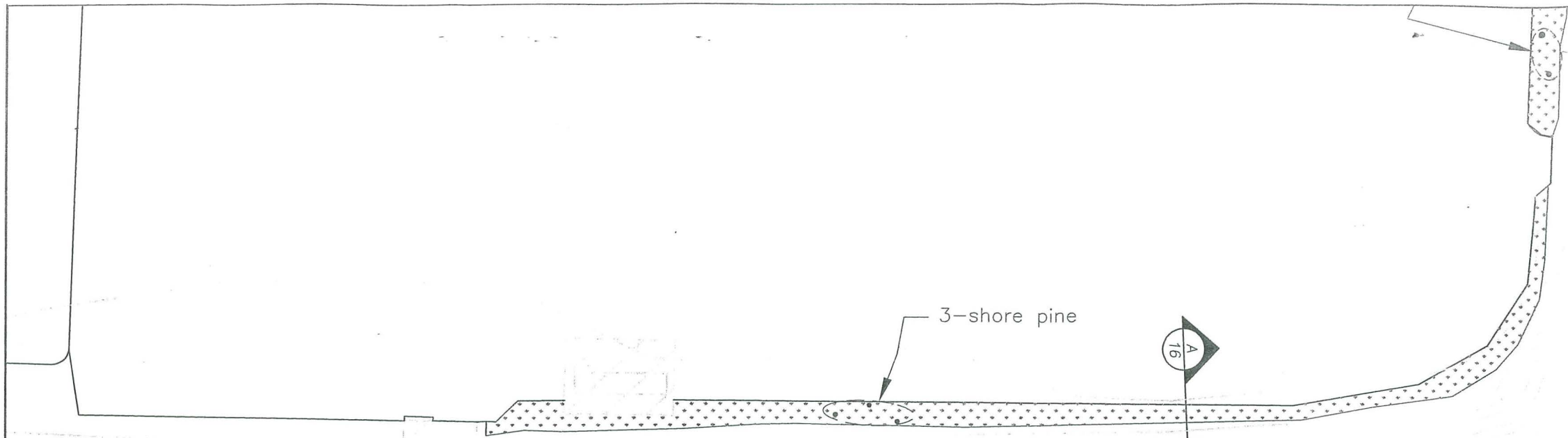
The 40' sheet specified between Sta 1+09.5 and Sta 1+11 was not installed. Instead, the southerly run of 20' sheets began at Sta 1+09.5 and ended 1+15.5 (1.5' short of the designed wall end). Deviation from a straight line occurs most extensively between Sta 0+20 and Sta 0+73. Stretching a line to "best-fit" the as-built horizontal alignment of the wall, the maximum deviation from a straight line is approximately 8".

VEGETATION RECOMMENDATIONS

- **Shoreline Segments 2, 3, and 4**
- **Shoreline Segment 42**
- **Shoreline Segment 43**
- **Shoreline Segment 44**
- **Typical Vegetation Species List**

Shoreline Segments 2, 3, and 4

NO	DATE	REVISION	BY	CH	APPROVED

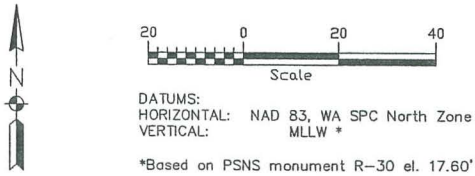


RECORD
DRAWING

Planting Schedule						
species	habit	plant size	number of plants			Total
			Segment 2 (estimated area 2100 sq. ft.)	Segment 3 (estimated area 4000 sq. ft.)	Segment 4 (estimated area 2100 sq. ft.)	
Pacific dogwood (<i>Cornus nuttallii</i>)	tree	6 ft trees	-	-	4	19
shore pine (<i>Pinus contorta</i> var. <i>contorta</i>)	tree	6 ft trees	3	4	-	
bitter cherry (<i>Prunus emarginata</i>)	tree	6 ft trees	-	4	-	
Oregon white oak (<i>Quercus garryana</i>)	tree	6 ft trees	-	2	2	
red-flowering currant (<i>Ribes sanguineum</i>)	shrub	1 gal pot	28	60	28	582
thimbleberry (<i>Rubus parviflorus</i>)	shrub	1 gal pot	28	60	28	
red elderberry (<i>Sambucus racemosa</i>)	shrub	1 gal pot	15	28	15	
snowberry (<i>Symphoricarpos albus</i>)	shrub	1 gal pot	15	28	15	
evergreen huckleberry (<i>Vaccinium ovatum</i>)	shrub	1 gal pot	45	86	45	
oceanspray (<i>Holodiscus discolor</i>)	shrub	1 gal pot	15	28	15	
kinnikinnik (<i>Arctostaphylos uva-ursi</i>)	ground-cover	1 gal pot	165	327	165	657

The trees in all segments are clustered as shown on the plans. Shrub plantings are spaced approx. 3 feet apart, groundcover plantings spaced 2 feet apart. Plant species are intermixed.

DRAWING REDUCED
HALFSIZE

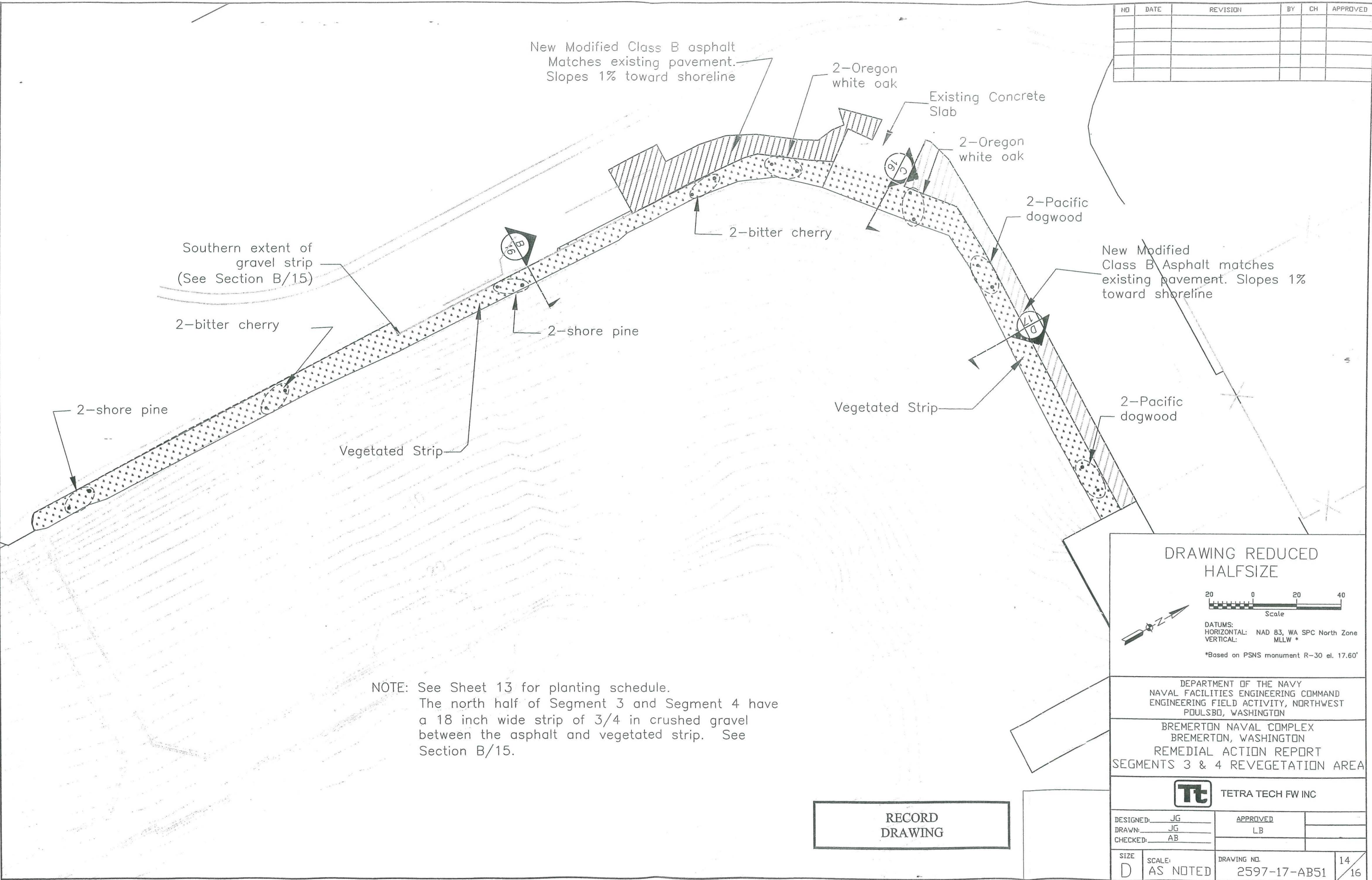


DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY, NORTHWEST
POULSBORO, WASHINGTON

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
REMEDIAL ACTION PLAN
SEGMENT 2 - REVEGETATION AREA

Tt TETRA TECH FW INC

DESIGNED: JG	APPROVED: LB	
DRAWN: JG		
CHECKED: AB		
SIZE: D	SCALE: AS NOTED	DRAWING NO. 2597-17-AB51
		13/16



NOTE: See Sheet 13 for planting schedule.
The north half of Segment 3 and Segment 4 have
a 18 inch wide strip of 3/4 in crushed gravel
between the asphalt and vegetated strip. See
Section B/15.

RECORD
DRAWING

NO	DATE	REVISION	BY	CH	APPROVED

DRAWING REDUCED HALFSIZE

20 0 20 40
Scale

DATUMS:
HORIZONTAL: NAD 83, WA SPC North Zone
VERTICAL: MLLW *

*Based on PSNS monument R-30 el. 17.60'

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY, NORTHWEST
POULSBORO, WASHINGTON

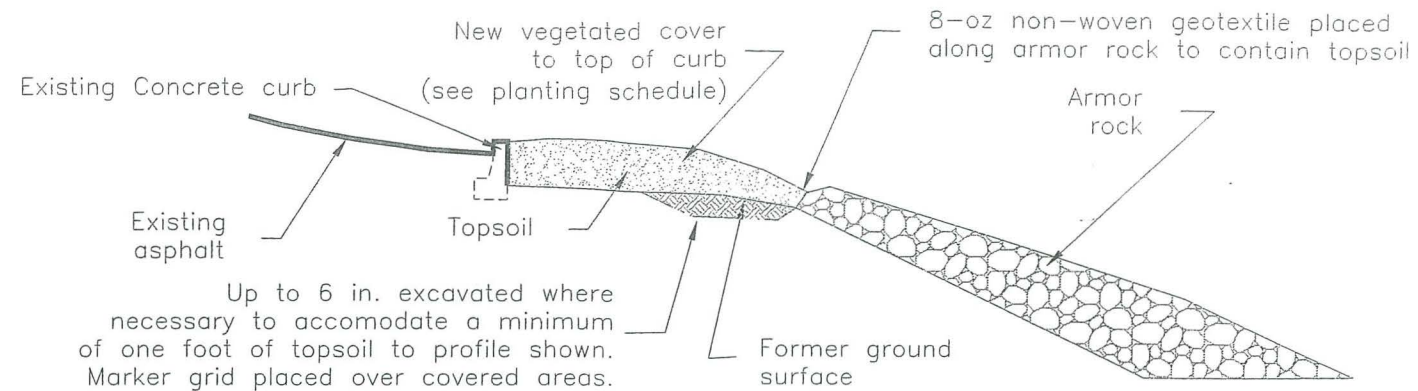
BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON
REMEDIAL ACTION REPORT
SEGMENTS 3 & 4 REVEGETATION AREA

Tt TETRA TECH FW INC

DESIGNED: JG	APPROVED: LB
DRAWN: JG	
CHECKED: AB	

SIZE: D	SCALE: AS NOTED	DRAWING NO. 2597-17-AB51	14 16
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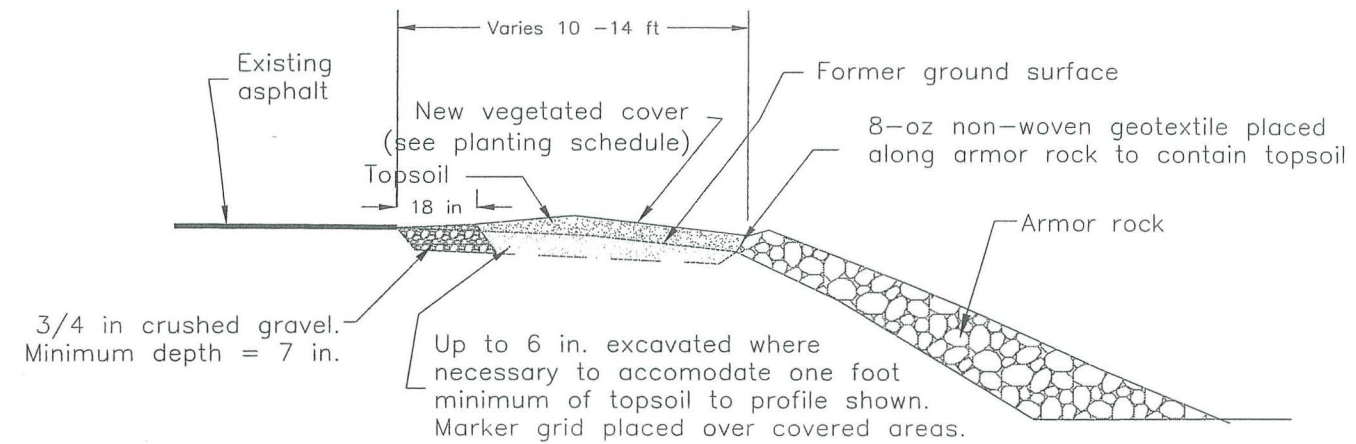
NO	DATE	REVISION	BY	CH	APPROVED



TYPICAL SECTION

N. T. S.

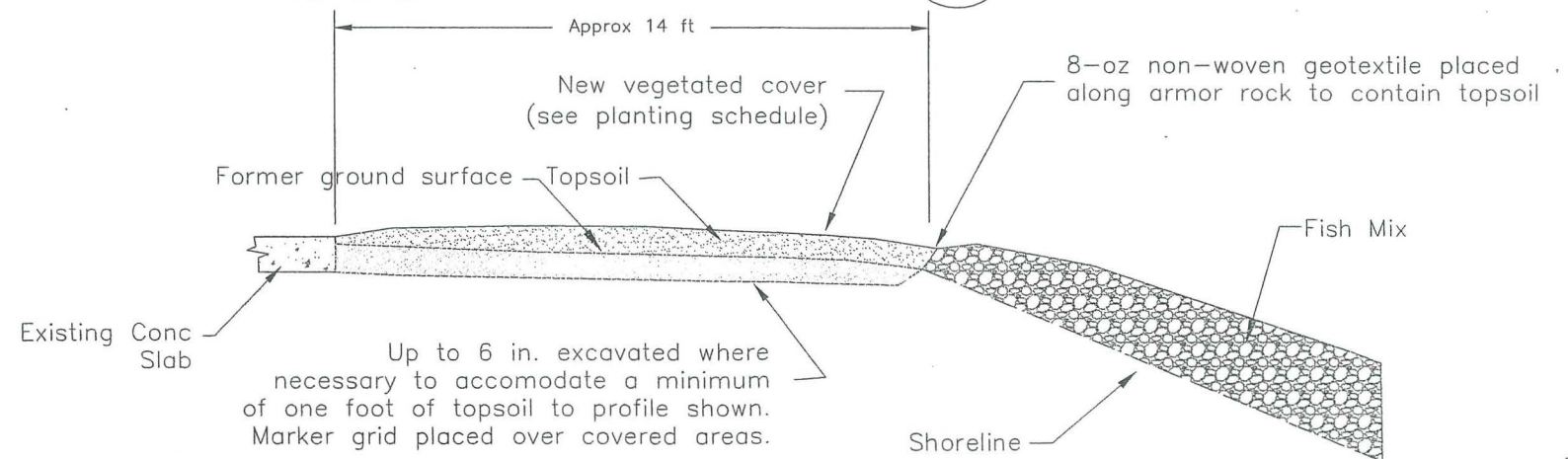
A
13



TYPICAL SECTION

N. T. S.

B
14



TYPICAL SECTION

N. T. S.

C
14

RECORD
DRAWING

DRAWING REDUCED
HALFSIZE

DEPARTMENT OF THE NAVY
 NAVAL FACILITIES ENGINEERING COMMAND
 ENGINEERING FIELD ACTIVITY, NORTHWEST
 POUKSBORO, WASHINGTON

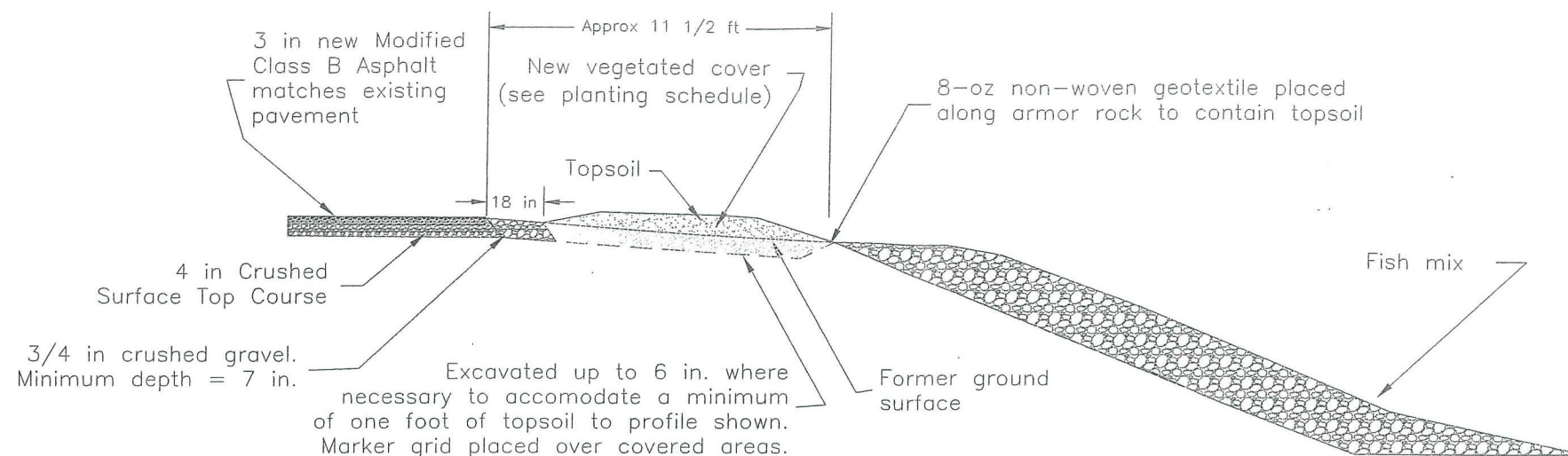
BREMERTON NAVAL COMPLEX
 BREMEROTN, WASHINGTON
 REMEDIAL ACTION REPORT
 SEGMENTS 2,3,4 REVEGETATION SECTIONS



TETRA TECH FW INC

DESIGNED: JG	APPROVED: LB	15 16
DRAWN: JG		
CHECKED: AB		
SIZE: D	SCALE: No Scale	DRAWING NO. 2597-17-AB51

NO	DATE	REVISION	BY	CH	APPROVED



TYPICAL SECTION
 N. T. S.

D
 14

RECORD
 DRAWING

DRAWING REDUCED
 HALFSIZE

DEPARTMENT OF THE NAVY
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 ENGINEERING FIELD ACTIVITY, NORTHWEST
 POUKSDO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
 BREMERION, WASHINGTON
 REMEDIAL ACTION REPORT
 SEGMENT 4 REVEGETATION SECTION

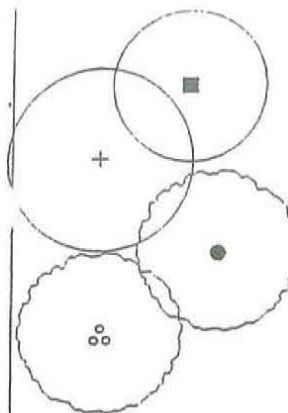
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DESIGNED: JG	APPROVED: LB
DRAWN: JG	
CHECKED: AB	

SIZE: D	SCALE: No Scale	DRAWING NO: 2597-17-AB51	16 / 16
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Shoreline Segment 42

LARGE SHRUBS OR SMALL TREES



- | | |
|------------------------------|-------------------------|
| <i>Amelanchier alnifolia</i> | — serviceberry |
| <i>Cotinus coggygria</i> | — green smoketree |
| <i>Garrya elliptica</i> | — coast silk-tassel |
| <i>Myrica californica</i> | — California wax-myrtle |

TALL SHRUBS



- | | |
|------------------------------|----------------|
| <i>Baccharis halimifolia</i> | — sea - myrtle |
|------------------------------|----------------|



- | | |
|-------------------------------|------------|
| <i>Berberis x mentorensis</i> | — barberry |
|-------------------------------|------------|



- | | |
|---------------------------|--------------------------|
| <i>Cistus laurifolius</i> | — laurel-leaved rockrose |
|---------------------------|--------------------------|



- | | |
|---------------------------|---------------------|
| <i>Mahonia aquifolium</i> | — tall Oregon-grape |
|---------------------------|---------------------|



- | | |
|-----------------------------|---------------|
| <i>Philadelphus lewisii</i> | — mock-orange |
|-----------------------------|---------------|



- | | |
|------------------------|-------------------------|
| <i>Ribes sanguinum</i> | — red-flowering current |
|------------------------|-------------------------|



- | | |
|--------------------|---------------|
| <i>Rosa rugosa</i> | — rugose rose |
|--------------------|---------------|



- | | |
|--------------------------|----------------|
| <i>Rubus parviflorus</i> | — thimbleberry |
|--------------------------|----------------|



- | | |
|------------------------------|----------------|
| <i>Shepherdia canadensis</i> | — buffaloberry |
|------------------------------|----------------|

LOW SHRUBS/GROUNDCOVERS



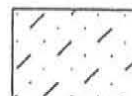
- | | |
|--------------------------------|----------------------------------|
| <i>Arctostaphylos uva-ursi</i> | — 'Vancouver Jade' kinnickinnick |
|--------------------------------|----------------------------------|



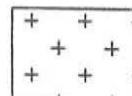
- | | |
|----------------------------|--------------------|
| <i>Fragaria chiloensis</i> | — beach strawberry |
|----------------------------|--------------------|



- | | |
|----------------------------|------------------|
| <i>Jasminum nudiflorum</i> | — winter jasmine |
|----------------------------|------------------|



- | | |
|-----------------------|--------------------|
| <i>Mahonia repens</i> | — low Oregon-grape |
|-----------------------|--------------------|



- | | |
|-------------------------------|-----------------|
| <i>Rosmarinus officinalis</i> | A-15 — rosemary |
|-------------------------------|-----------------|

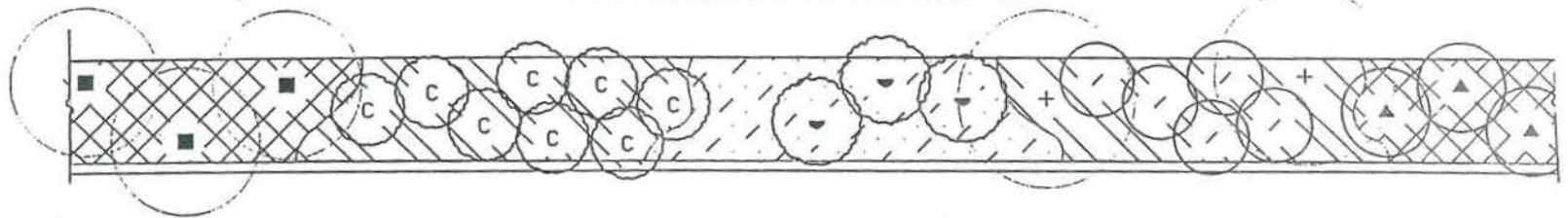
TYPICAL PLANTING AREAS "A", "B", & "C"

1" = 8'

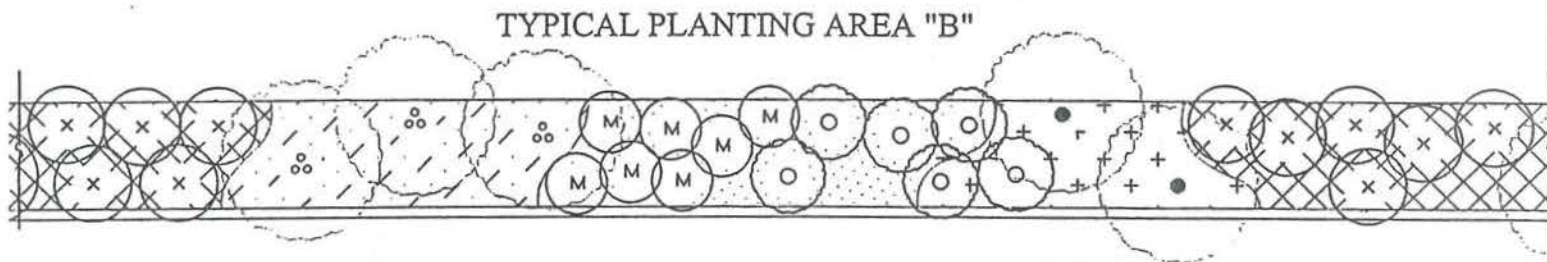
NOTES:

LOW SHRUBS / GROUNDCOVERS ARE NOT
INDICATED WITHIN A 3' DIAMETER CIRCLE
SURROUNDING OTHER SHRUBS AND TREES

TYPICAL PLANTING AREA "A"



Puget Sound Naval Shipyard
Seawall Upgrade and
Parking Lot Rehabilitation
D.O. # N44255-95-D-6030



A-18

MATCH LINE TYP.

SEAWALL

TYPICAL PLANTING AREA "C"

PARKING LOT

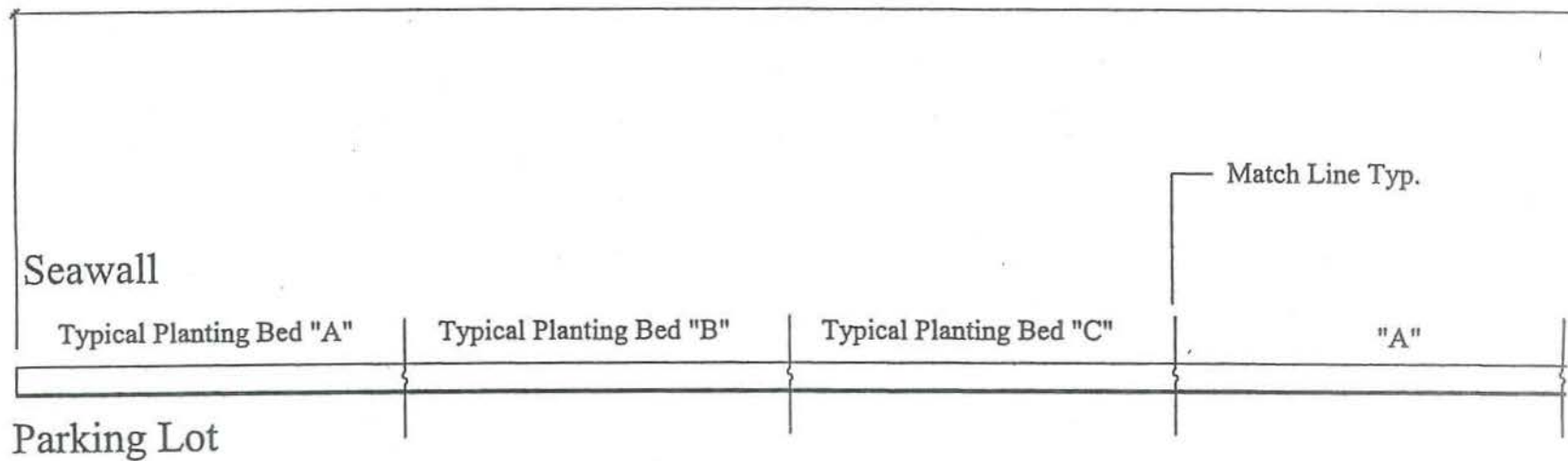
Parametrix, Inc.
April 2, 1998

SEAWALL DIAGRAM

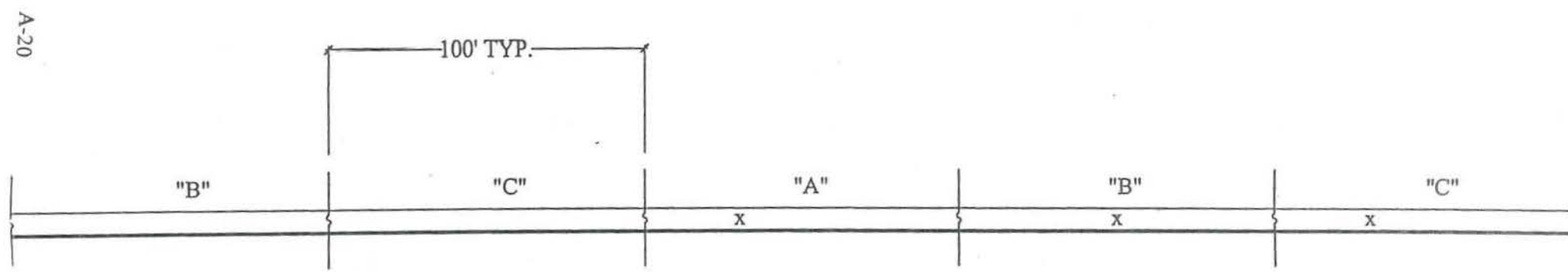
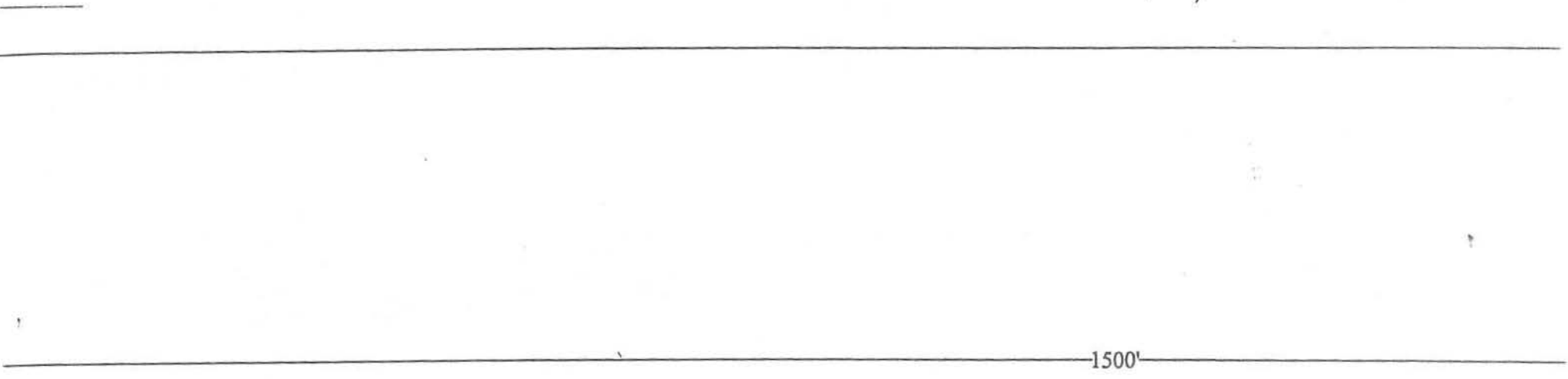
1" = 30'

NOTES:

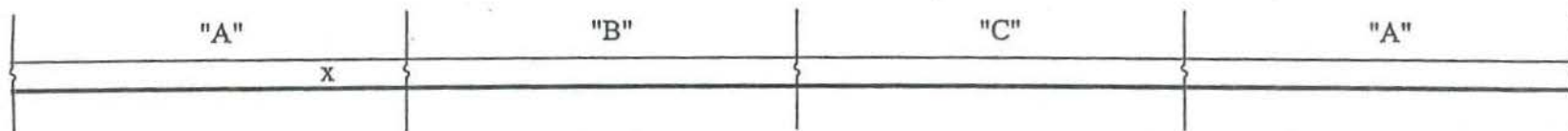
- PLANTING AREAS MAY BE ARRANGED IN NON-CONSECUTIVE ORDER
- x INDICATES LOCATIONS OF NESTING BOXES



Puget Sound Naval Shipyard
Seawall Upgrade and
Parking Lot Rehabilitation
D.O. #N44255-95-D-6030

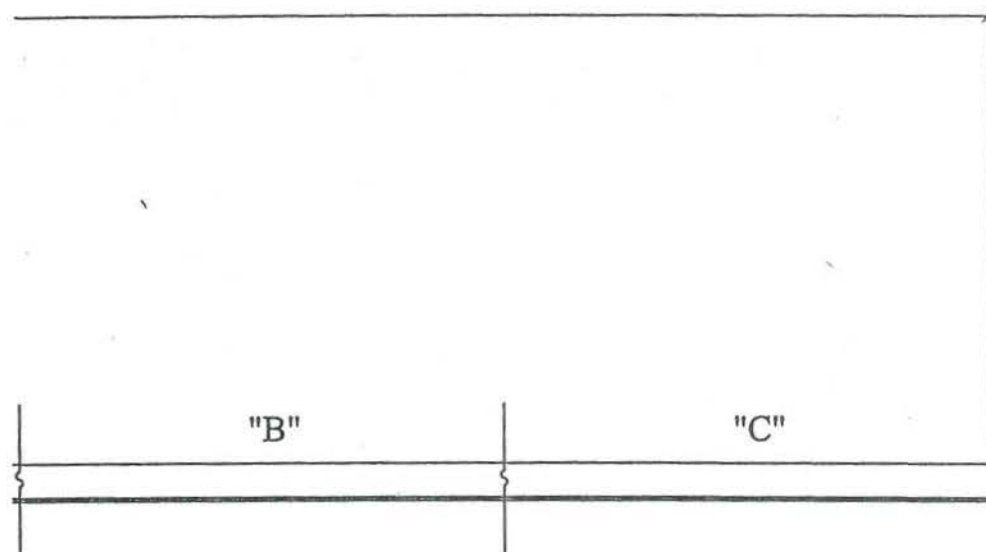


A-21



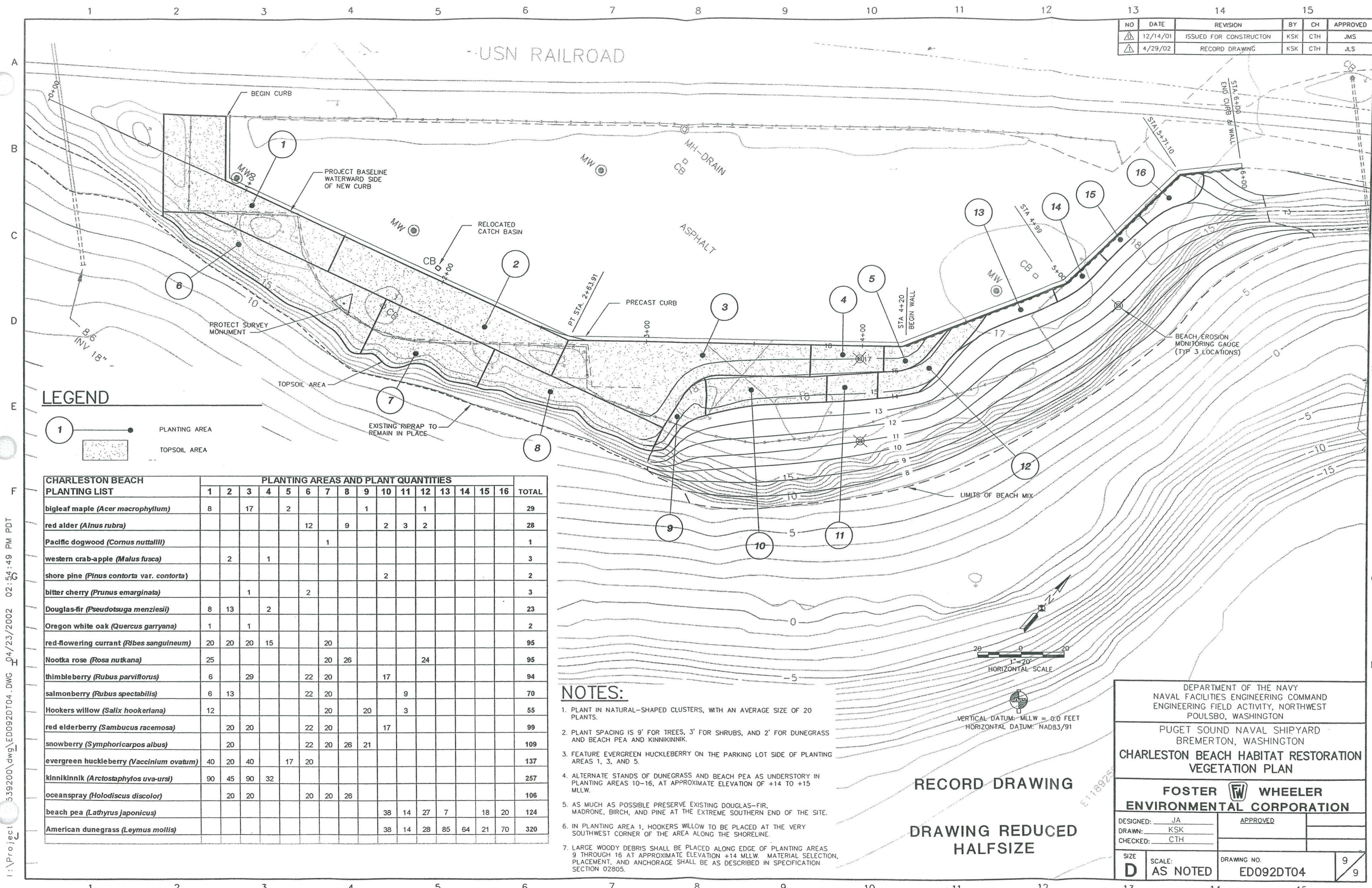
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A-22



Parametrix, Inc.
April 2, 1998

Shoreline Segment 43



NO	DATE	REVISION	BY	CH	APPROVED
1	12/14/01	ISSUED FOR CONSTRUCTION	KSK	CTH	JMS
2	4/29/02	RECORD DRAWING	KSK	CTH	JLS

LEGEND

- 1 PLANTING AREA
- TOPSOIL AREA

CHARLESTON BEACH PLANTING LIST	PLANTING AREAS AND PLANT QUANTITIES																TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
bigleaf maple (<i>Acer macrophyllum</i>)	8		17		2				1			1					29
red alder (<i>Alnus rubra</i>)					12		9		2	3	2						28
Pacific dogwood (<i>Cornus nuttallii</i>)							1										1
western crab-apple (<i>Malus fusca</i>)		2		1							2						3
shore pine (<i>Pinus contorta</i> var. <i>contorta</i>)										2							2
bitter cherry (<i>Prunus emarginata</i>)			1		2												3
Douglas-fir (<i>Pseudotsuga menziesii</i>)	8	13		2			20	26					24				23
Oregon white oak (<i>Quercus garryana</i>)	1		1														2
red-flowering currant (<i>Ribes sanguineum</i>)	20	20	20	15			20										95
Nootka rose (<i>Rosa nutkana</i>)	25						20	26					24				95
thimbleberry (<i>Rubus parviflorus</i>)	6	29			22	20				17							94
salmonberry (<i>Rubus spectabilis</i>)	6	13			22	20				9							70
Hookers willow (<i>Salix hookeriana</i>)	12						20		20		3						55
red elderberry (<i>Sambucus racemosa</i>)		20	20		22	20				17							99
snowberry (<i>Symphoricarpos albus</i>)		20			22	20	26	21									109
evergreen huckleberry (<i>Vaccinium ovatum</i>)	40	20	40		17	20											137
kinnikinnik (<i>Arctostaphylos uva-ursi</i>)	90	45	90	32													257
oceanspray (<i>Holodiscus discolor</i>)		20	20			20	20	26									106
beach pea (<i>Lathyrus japonicus</i>)										38	14	27	7		18	20	124
American dunegrass (<i>Leymus mollis</i>)										38	14	28	85	64	21	70	320

NOTES:

- PLANT IN NATURAL-SHAPED CLUSTERS, WITH AN AVERAGE SIZE OF 20 PLANTS.
- PLANT SPACING IS 9' FOR TREES, 3' FOR SHRUBS, AND 2' FOR DUNEGRASS AND BEACH PEA AND KINNIKINNIK.
- FEATURE EVERGREEN HUCKLEBERRY ON THE PARKING LOT SIDE OF PLANTING AREAS 1, 3, AND 5.
- ALTERNATE STANDS OF DUNEGRASS AND BEACH PEA AS UNDERSTORY IN PLANTING AREAS 10-16, AT APPROXIMATE ELEVATION OF +14 TO +15 MLLW.
- AS MUCH AS POSSIBLE PRESERVE EXISTING DOUGLAS-FIR, MADRONE, BIRCH, AND PINE AT THE EXTREME SOUTHERN END OF THE SITE.
- IN PLANTING AREA 1, HOOKERS WILLOW TO BE PLACED AT THE VERY SOUTHWEST CORNER OF THE AREA ALONG THE SHORELINE.
- LARGE WOODY DEBRIS SHALL BE PLACED ALONG EDGE OF PLANTING AREAS 9 THROUGH 16 AT APPROXIMATE ELEVATION +14 MLLW. MATERIAL SELECTION, PLACEMENT, AND ANCHORAGE SHALL BE AS DESCRIBED IN SPECIFICATION SECTION 02805.

RECORD DRAWING
DRAWING REDUCED
HALFSIZE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY, NORTHWEST
POULSBORO, WASHINGTON

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON

CHARLESTON BEACH HABITAT RESTORATION
VEGETATION PLAN

FOSTER W WHEELER
ENVIRONMENTAL CORPORATION

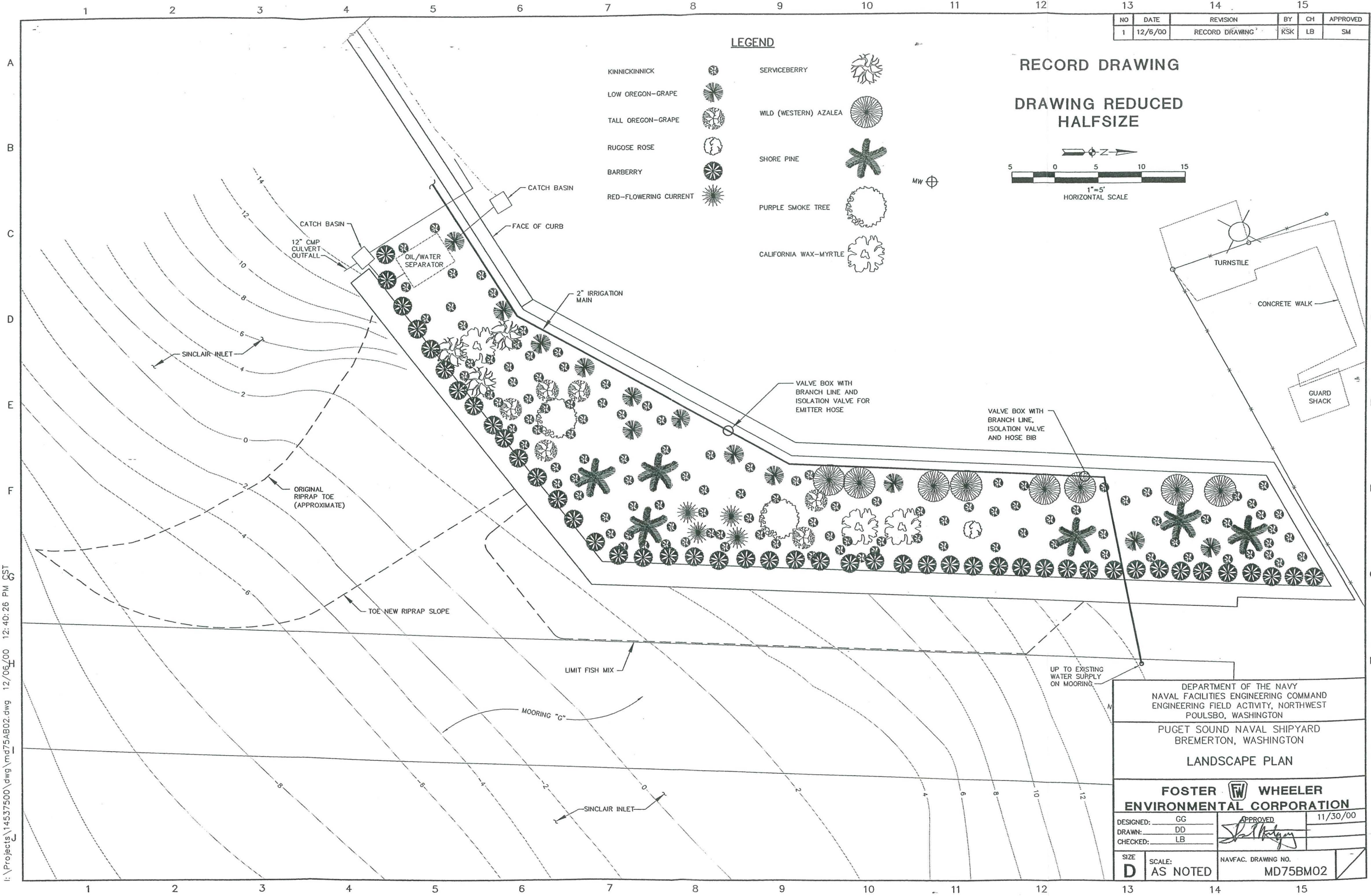
DESIGNED: JA
DRAWN: KSK
CHECKED: CTH

APPROVED

SIZE: D
SCALE: AS NOTED
DRAWING NO.: ED092DT04

9/9

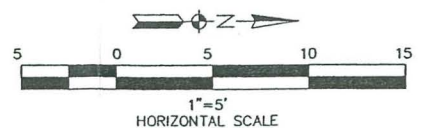
Shoreline Segment 44



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NO	DATE	REVISION	BY	CH	APPROVED
1	12/6/00	RECORD DRAWING	KSK	LB	SM

RECORD DRAWING
DRAWING REDUCED
HALFSIZE



DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY, NORTHWEST POULSBORO, WASHINGTON	
PUGET SOUND NAVAL SHIPYARD BREMERTON, WASHINGTON	
LANDSCAPE PLAN	
FOSTER WHEELER ENVIRONMENTAL CORPORATION	
DESIGNED: GG	APPROVED: 11/30/00
DRAWN: DD	
CHECKED: LB	
SIZE: D	SCALE: AS NOTED
NAVFAC. DRAWING NO. MD75BM02	

Typical Vegetation Species List

Typical Vegetation Species List^{1/}

Plants	Type	Size	Spacing
Kinnikinnik (<i>Arctostaphylos uva-ursi</i>)	Groundcover	1 gal.	2 feet on center
Low Oregon-grape (<i>Mahonia repens</i>)	Low shrub	1 gal.	2 feet on center
Barberry (<i>Berberis mentorensis</i>)	Tall shrub	1 gal.	6 feet on center
Tall Oregon-grape (<i>Mahonia aquilifolium</i>)	Tall shrub	2 gal.	6 feet on center
Red-flowering Current (<i>Ribes sanguineum</i>)	Tall shrub	5 gal.	6 feet on center
Rugose rose (<i>Rose rugosa</i>)	Tall shrub	1 gal.	6 feet on center
Wild Azalea (<i>Rhododendron occidentale</i>)	Tall shrub	2 gal.	6 feet on center
Serviceberry (<i>Amelanchier alnifolia</i>)	Large shrub or small trees	5 gal.	8 feet on center
Purple Smoketree (<i>Cotinus coggygria</i>)	Large shrub or small trees	5 gal.	8 feet on center
Green Smoketree (<i>Cotinus coggygria</i>)	Large shrub or small trees	5 gal.	8 feet on center
California Wax-myrtle (<i>Myrica californica</i>)	Large shrub or small trees	5 gal.	8 feet on center
Shore Pine (<i>Pinus contorta</i>)	Large shrub or small trees	5 gal.	8 feet on center

^{1/} Soil medium for the planting area shall be as follows:

pH: 5.5 - 7.0

Clay: 5-10%

Loam/Compost: 25-30%

Sand: 60-70%

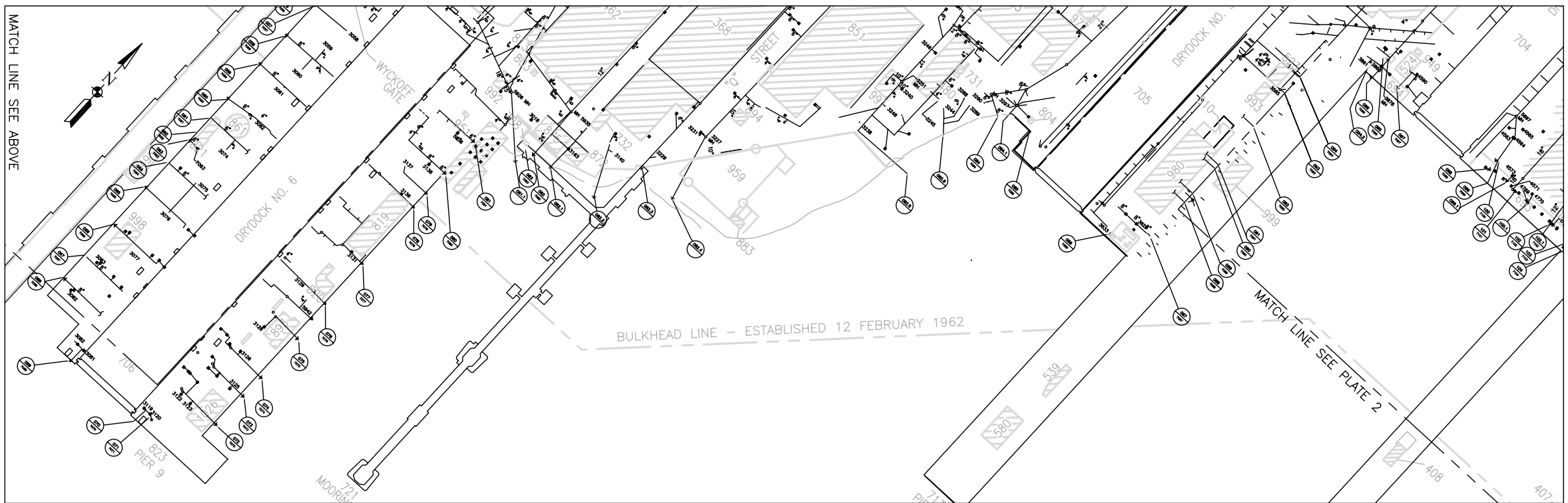
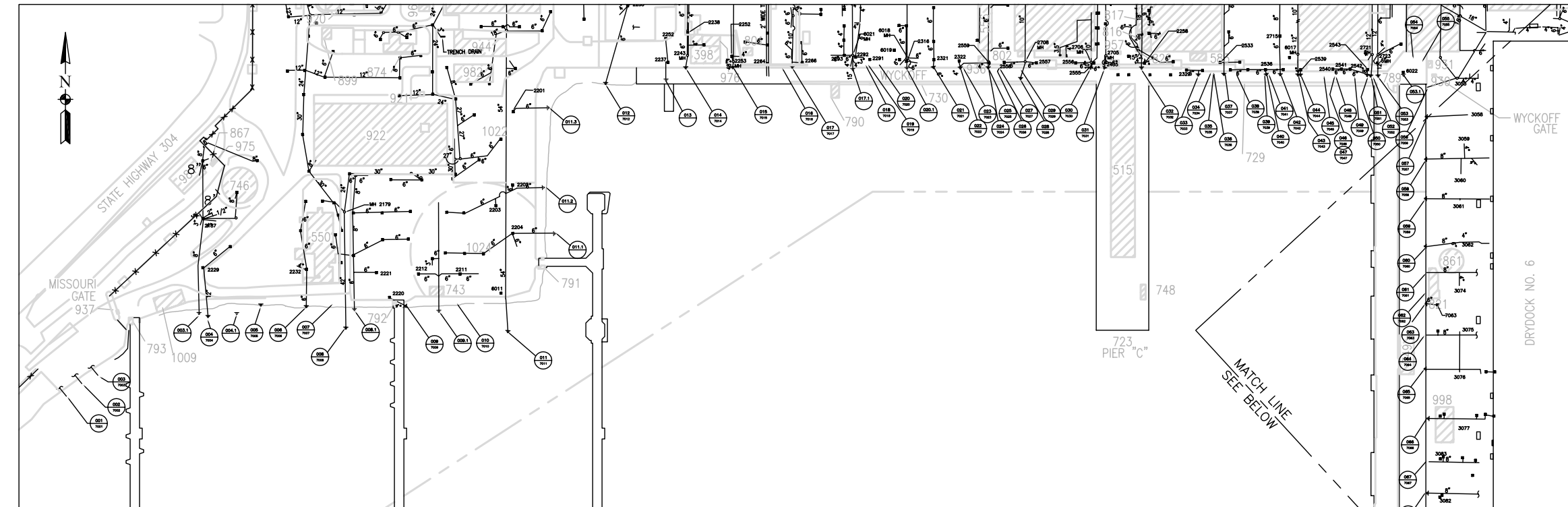
Soil should be placed at a minimum thickness of 1 foot.

After placement, the soil shall be amended with a 100% organic 4-4-4 fertilizer. The fertilizer should be spread evenly over the surface of the soil medium and mixed in prior to plant installation.




PLATES

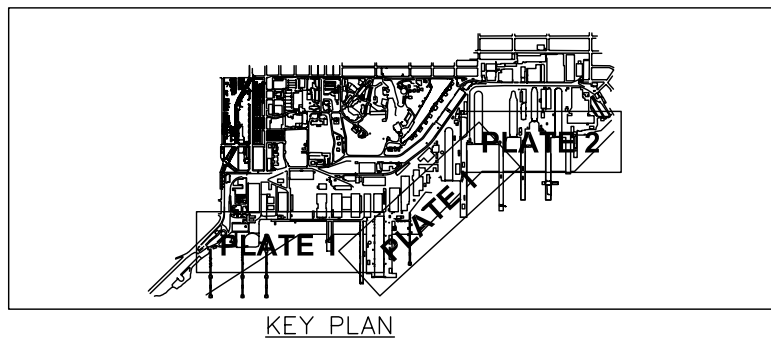
Plate 1. Catch Basin Inspections—West

Plate 2. Catch Basin Inspections—East



LEGEND:

-  OUTFALL IDENTIFIER
-  2221 CATCH BASIN
-  MANHOLE



KEY PLAN






DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND NORTHWEST
SILVERDALE, WASHINGTON

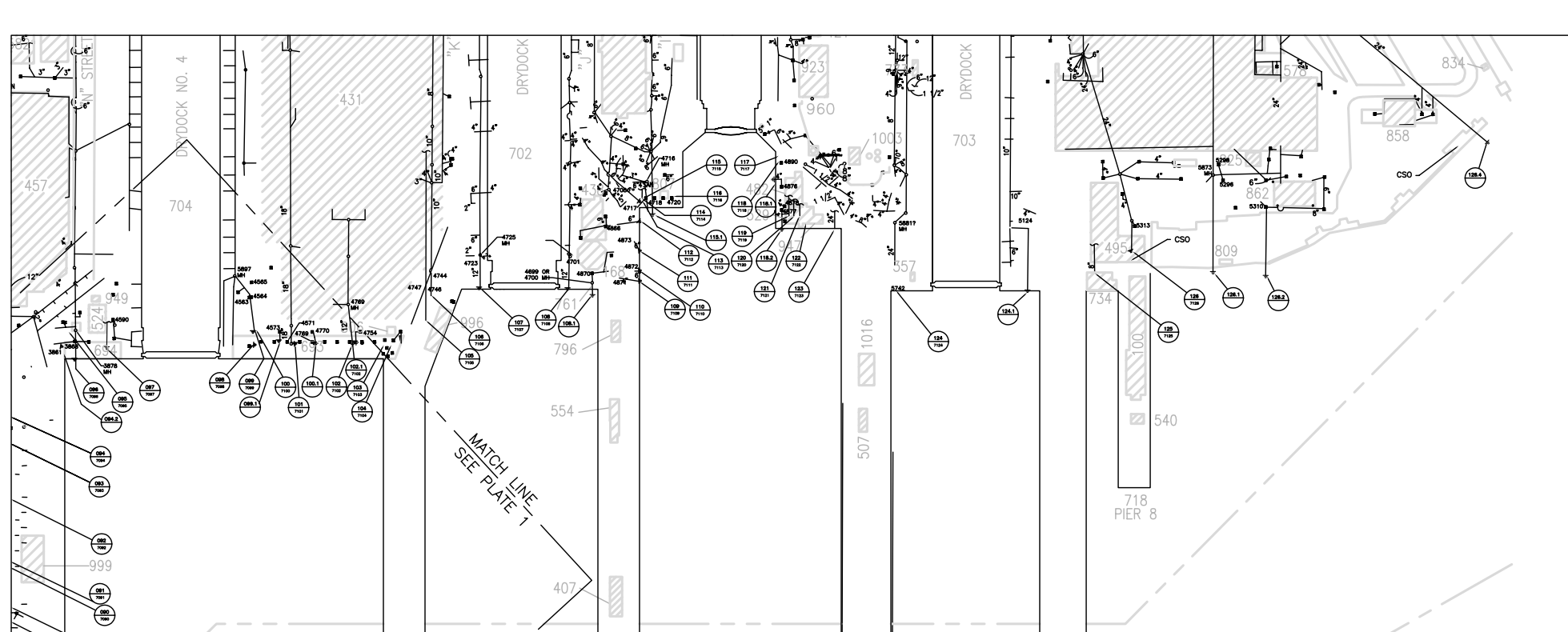
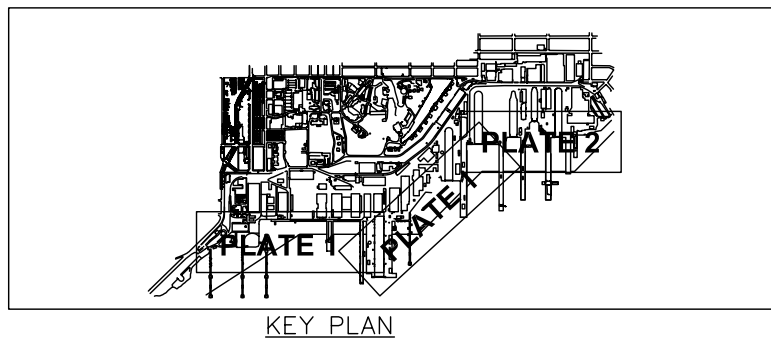


TETRA TECH EC, INC.

PLATE 1
CATCH BASIN AND OUTFALL LOCATIONS

LEGEND:

-  OUTFALL IDENTIFIER
-  2221 CATCH BASIN
-  MANHOLE



DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND NORTHWEST
SILVERDALE, WASHINGTON



TETRA TECH EC, INC.

PLATE 2
CATCH BASIN AND OUTFALL LOCATIONS



FINAL
28 FEBRUARY 2006

Institutional Control Work Plan

Bremerton Naval Complex

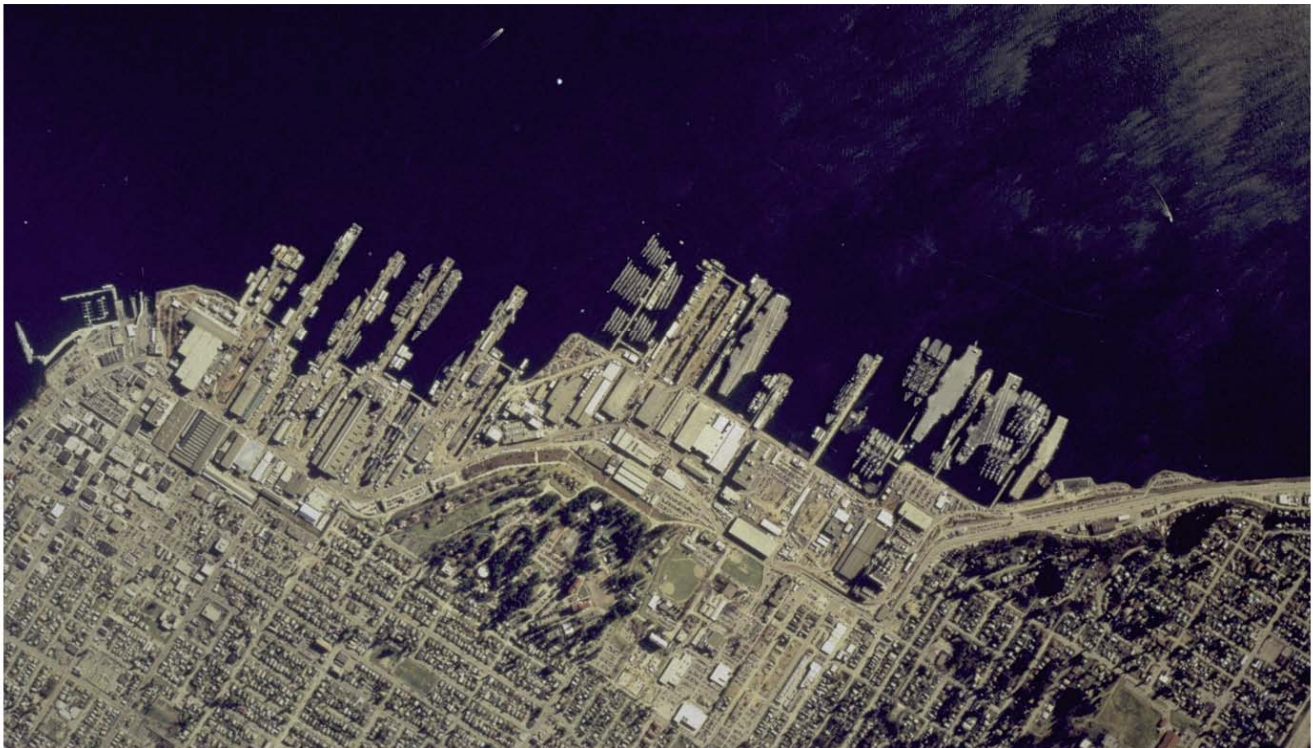
Bremerton, Washington

Department of the Navy

Naval Facilities Engineering Command Northwest

1101 Tautog Circle, Suite 203

Silverdale, WA 98315-1101



CONTRACT NO. N44255-01-D-2000
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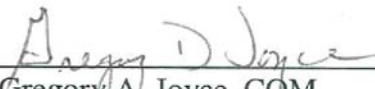
FINAL
INSTITUTIONAL CONTROL WORK PLAN

BREMERTON NAVAL COMPLEX
BREMERTON, WASHINGTON

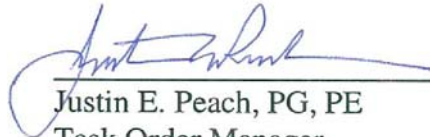
TETRA TECH EC, INC.

FEBRUARY 28, 2006

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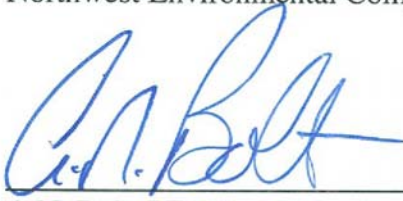


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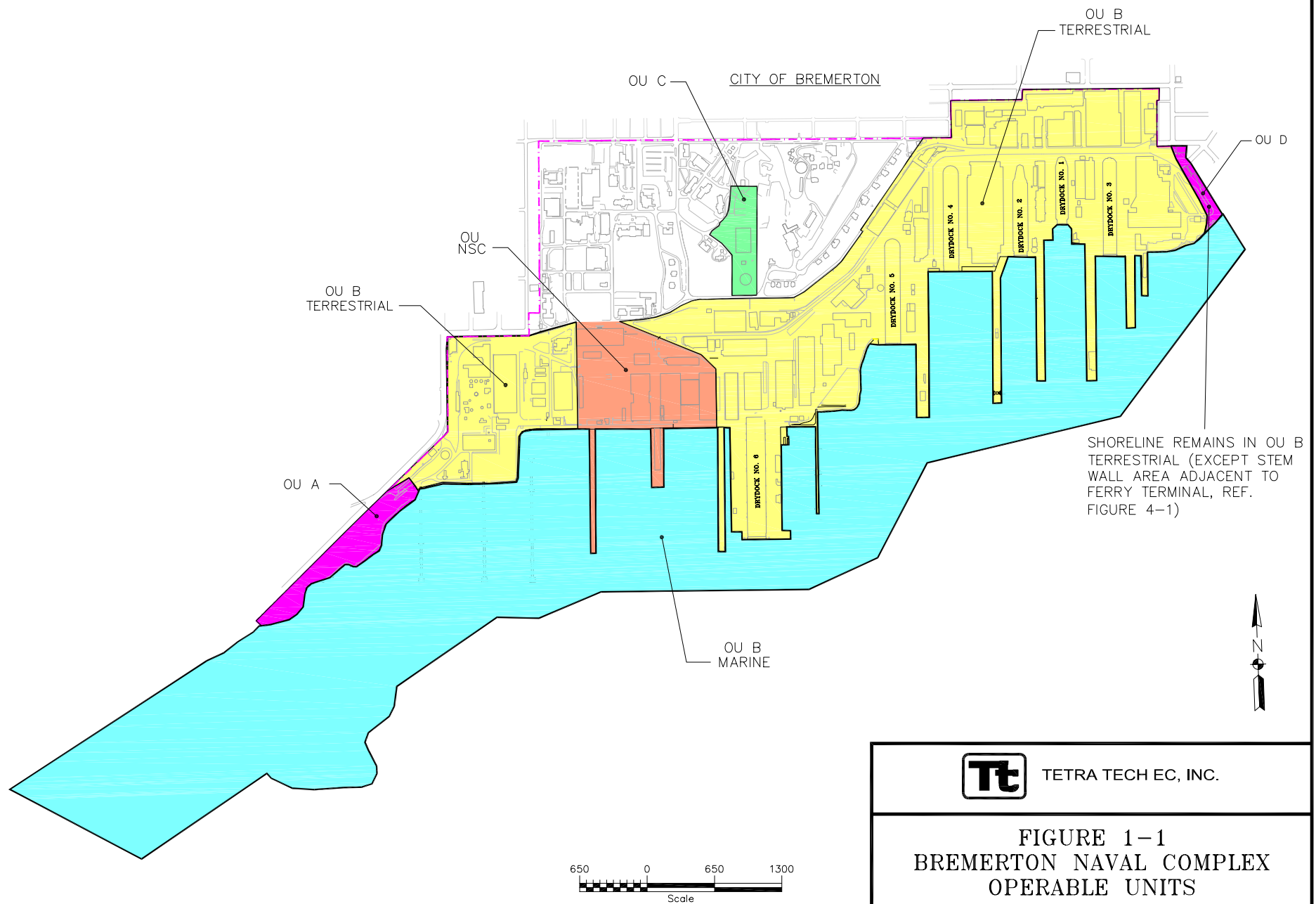
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ACRONYMS AND ABBREVIATIONS

BNC	Bremerton naval complex
CAD	Confined Aquatic Disposal
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIA	Controlled Industrial Area
COC	contaminant of concern
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FOST	Finding of Suitability to Transfer
IC	Institutional Control
LUC	land use control
NAVFAC NW	Naval Facilities Engineering Command Northwest
NBK	Naval Base Kitsap
NCP	National Contingency Plan
NPL	National Priorities List
NSC	Naval Supply Center
O&M	Operation and Maintenance
OU	Operable Unit
PSNS & IMF	Puget Sound Naval Shipyard and Intermediate Maintenance Facility
PSRB	Physical Security Review Board
PSRC	Physical Security Review Committee
RAO	remedial action objective
ROD	Record of Decision
SOP	Standard Operating Procedure
TtEC	Tetra Tech EC, Inc.

1. INTRODUCTION

This Institutional Control (IC) Work Plan describes the procedures for implementing the IC remedial objectives for Operable Units (OUs) A, B Marine, B Terrestrial, D, and Naval Supply Center (NSC) at the Bremerton naval complex (BNC) (Figure 1-1). The BNC encompasses Naval Base Kitsap (NBK) at Bremerton and the Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF). In May 1994, the U.S. Environmental Protection Agency (EPA) placed the BNC on the National Priorities List (NPL) in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP). An IC Work Plan is prepared as part of the CERCLA process in the site's remedial action. The objective of the IC is to protect human health, the environment, and the integrity of an engineering remedy by limiting the activities that may occur at a particular contaminated site. ICs ensure that property uses remain compatible with cleanup decisions.



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FIGURE 1-1
BREMERTON NAVAL COMPLEX
OPERABLE UNITS

2. INSTITUTIONAL CONTROLS

ICs are restrictions or administrative requirements placed on activities, access, or exposure to land, groundwater, surface water, or other affected media. The ICs at the BNC consist of various combinations of actions based on access, land use, groundwater use restrictions, and administrative requirements to meet the Record of Decision (ROD) remedial action objective (RAO) of limiting human exposure to site soils and groundwater. The objectives of the ICs implemented at the BNC are:

- Ensure that access to the BNC is controlled
- Ensure that the sole use of groundwater is for monitoring purposes
- Ensure that excavations are managed appropriately given the contaminants left in place
- Ensure that the established industrial use of the site is maintained

The ICs for the BNC are detailed in the documents listed in Table 2-1 (or most current versions).

Table 2-1. Institutional Control Requirements

Requirements	Type of IC			
	Access Control	Groundwater Restrictions	Excavation Management	Land Use Restrictions
IC Work Plan	x	x		x
Navy Physical Security - OPNAVINST 5530.14C	x			
Physical Security, Access and Movement Control at Shore Activities - NAVSEAINST 5510.2B	x			
Puget Sound Naval Shipyard Physical Security - NAVSHIPYDPUGETINST 5530.1	x			
NAVSTAINST 5530.1	x			
Outages and Excavations - NAVSTABREMERTON INSTRUCTION 11310.10D		x	x	

Inspection and maintenance of the ICs as detailed in the Operation and Maintenance (O&M) Plan (Tetra Tech EC, Inc. [TtEC] 2006) will ensure the ROD RAO of limiting human

exposure to site soils and groundwater is maintained. The ICs will be maintained until contaminant levels allow for unlimited use and unrestricted exposure.

A checklist detailing the inspection requirements and frequency is provided as Table 2-2. Observations will be documented on the checklists, and via photographs, if necessary.

2.1 ACCESS CONTROL—SIGNAGE AND SECURITY

The RODs for OUs A, B Marine, B Terrestrial, D, and NSC require access restrictions in the form of fencing and warning signs (U.S. Navy 2005, 2004a, 2004b, 2000, 1997, 1996). The intent of these two security measures is to control and restrict access to the BNC, including the various OUs. Documents describing the BNC access control procedures are listed in Table 2-1.

As required by the instructions, fencing and access control signs have been installed along the BNC boundary to limit access to official personnel only. Fencing is installed along the perimeter of the BNC except for the southwestern portion within OU A. Access to this parking area is from a single point off State Route 304. Fencing separates the parking area from the remainder of the BNC. Security signs are installed throughout the BNC: along the vegetative strips in the southernmost portion of OU A (Charleston Beach), along the BNC shoreline, on the BNC perimeter fence line, on the fencing separating the Missouri parking lot and NBK at Bremerton, on the piers, and on the floating boom fencing in Sinclair Inlet. These signs control access to the BNC, including the marine portion of the BNC property (see Appendix A).

The Physical Security Office maintains the fencing and signage around the BNC and monitors the effectiveness of the access controls. The Physical Security Office inspects the offshore areas and the upland perimeter fencing. Security Officers inspect the fencing for bent posts and/or rails, gaps in mesh or connections, and disturbed ground areas adjacent to the fence. If security determines that the gaps are “human passable,” an armed guard is stationed at the access point until the fencing is repaired and the area is once again secured. Any worn, damaged, or missing signs are also documented during the inspection. These worn, damaged, or missing signs are repaired or replaced by the Public Works Office (or designee) no later than 1 week after discovery, if practical. The results of the inspections are documented and forwarded to the Physical Security Supervisor for review. The Physical Security Supervisor performs a daily review of the checklists to ensure the proper information is being entered onto the checklist and that action items are completed within the proper time periods.

The Physical Security Review Board (PSRB) and Physical Security Review Committee (PSRC) evaluate changes to fencing or signage to ensure access to the BNC, including OUs A, B Marine, B Terrestrial, D, and NSC, remains controlled.

In addition to fencing and signage, a majority of OU B Terrestrial is located within the Controlled Industrial Area (CIA) of the BNC, an area with more restricted access and controls than the naval base portion of the installation. Only personnel with approved security badges are allowed entrance into the CIA. Prior to entering the CIA, all visitors receive security and safety briefings. In general, only military personnel, personnel with approved security badges, or those escorted by a military person or a security-badged person are allowed access into the BNC.

If an unauthorized entrance to the BNC occurs, the Security Officers complete a Security Trespass Report. The report includes information on where the trespass occurred, how long the individual was on base, the age of the individual, and the citation or warning issued. The Trespass Reports are forwarded to the legal department. As part of the monitoring process the Security Department shall provide to Naval Facilities Engineering Command Northwest (NAVFAC NW) a summary of the number of incidents that occurred during the previous fiscal year (October through September), by November 1 of each year.

This restricted access also results in fish and shellfish restrictions on Navy property within Sinclair Inlet.

Figure 2-1 is a decision diagram to be used in the implementation of the Access Control—Signage and Security IC.

2.2 ACCESS CONTROL—CONFINED AQUATIC DISPOSAL SITE AND SEDIMENT CAP

This IC Work Plan requires protection of the sediment caps within Sinclair Inlet. The ROD for OU B Marine requires land-use restrictions to protect the confined aquatic disposal (CAD) site and the thick/thin caps adjacent to the CAD site (reference figure included in Appendix A).

Access control by the BNC security force indirectly results in maintaining the integrity of the thick/thin caps and the CAD cap located within OU B Marine. Because unauthorized personnel cannot access Navy property from Sinclair Inlet due to security restrictions, non-Navy personnel are restricted from anchoring over the thick/thin caps or the CAD pit. To ensure Navy personnel do not anchor over the CAD pit or the thick/thin caps and compromise the ROD remedy, Port Operations personnel are required to use caution when

navigating in the area of the CAD site and take necessary preventative measures to protect against damage. Port Operations shall ensure that no anchoring, dredging, or construction is performed in this area. Implementation of these controls shall ensure the integrity of the caps is maintained.

2.3 PROHIBITING GROUNDWATER USE

Groundwater use is restricted to monitoring purposes only. Use of groundwater for any other purposes is prohibited. Groundwater from monitoring wells and excavation sites may not be withdrawn for human consumption, equipment maintenance, or equipment decontamination. This instruction requires that NAVFAC NW, on a semi-annual basis or when personnel are seen removing groundwater from wells or excavations, approach those withdrawing the water to determine the intended use of the water.

If discussions indicate that the water is not solely for monitoring purposes as part of a BNC monitoring program, NAVFAC NW will immediately contact the appropriate Environmental Office. The Environmental Office will investigate as to the purpose of the groundwater withdrawal and follow up with the appropriate Supervisor or Contracting Officer, if required.

NAVFAC NW is responsible for reviewing and distributing this instruction to all BNC personnel and contractors installing, decommissioning, and repairing any monitor wells on site, along with those conducting groundwater monitoring. The handling of groundwater from excavation sites is discussed in NAVSTABREMERTON INSTRUCTION 11310.10D, Outages and Excavations, and in the attached Standard Operating Procedure (SOP) for Excavation Management (which is included as Appendix B to this IC Plan). In the event of an update, the most current versions of guidelines and instructions should be used.

Figure 2-2 is a decision diagram to be used in the implementation of the Prohibiting Groundwater Use IC.

2.4 EXCAVATION MANAGEMENT

The management of excavations involves the protection of human health and the environment and maintenance of the ROD remedy. The human health risk assessments for OUs A, B Terrestrial, D, and NSC concluded that risks to site workers are acceptable under the current land use conditions and controls. However, some excavations will breach the pavement cap and vegetative covers throughout the BNC and increase the potential of workers being temporarily exposed to contaminants. The primary pathways for human contact with the contaminants are through the skin and lung tissues. To minimize exposure

to the contaminants of concern (COCs) during excavation activities, the SOP for Excavation Management was developed to provide guidelines for BNC personnel and contractors. This SOP ensures workers are informed of the site hazards and that the site is restored such that the ROD remedy is maintained. The SOP requires BNC personnel and contractors to coordinate with BNC management prior to any excavation activities. This SOP also includes BNC and contractor responsibilities and actions, as well as requirements for determining personnel protection from hazardous chemicals during excavations.

NAVSTABREMERTON INSTRUCTION 11310.10D, Outages and Excavations, provides requirements for utility outage requests, rail line track closures, excavation permits, and road/sidewalk revision requests. An excavation permit is required for all excavations within the BNC.

Figure 2-3 is a decision diagram to be used in the implementation of the Excavation Management IC.

2.5 LAND USE RESTRICTIONS

Land use restrictions involve maintaining the BNC as an industrial facility. Land use restrictions also involve future land transfers or modifications in property usage. The RODs for OUs A, B Terrestrial, D, and NSC require restrictions on land use development as well. Land use within OUs A, B Terrestrial, and NSC is strictly industrial in nature and is expected to remain so for the foreseeable future. OU D has been evaluated for recreational use and is anticipated to be transferred to the City of Bremerton. Note that the shoreline adjacent to OU D to the high tide line is part of OU B Terrestrial and will not be transferred to the City of Bremerton. OU B Marine is the security exclusion and buffer zone encompassing the waters of Sinclair Inlet (Figure 1-1). Navy Region Northwest retains approval authority for future consideration of land use changes, including transfer of Navy property to a non-Navy entity.

Figure 2-4 is a decision diagram to be used in the implementation of the Land Use Restrictions IC.

2.5.1 Institutional Controls on BNC

NAVFAC NW will maintain a central database of properties restricted by ICs in order to manage their responsibilities. The database will include relevant information on the property, types of ICs established, any land use monitoring and management responsibilities, and the location of real estate records. This database shall be incorporated into the BNC Base Comprehensive Plan to allow for routine considerations for ICs in

making land use and planning decisions. The ICs shall also be filed with Public Works (i.e., offices responsible for managing the building and grounds, utility systems, and construction).

2.5.2 New Construction

New construction and maintenance activities within OUs A, B Terrestrial, D, and NSC will remain industrial in nature to ensure that ICs remain effective. No residential type facilities such as daycare, housing, and schools will be developed within these OUs. The entity proposing to complete the new construction or maintenance activity shall follow the SOP for Excavation Management and NAVSTABREMINST 11310.10D, Outages and Excavations (or most current revision).

As-built drawings and the IC database located at NAVFAC NW document the location of the shoreline systems, pavement caps and vegetative covers, thick/thin caps, CAD pit, and the ICs implemented as part of the ROD remedy. NAVFAC NW will review and appropriately route plans for any new construction activity at the BNC to ensure the land use remains industrial and that the ROD remedies, including ICs, are maintained. The ICs shall also be provided to the BNC contract and real estate property offices so that contracts and outgrants can reflect ICs, as appropriate. This review by NAVFAC NW will prevent uncontrolled excavation and uncontrolled construction along the shoreline and within BNC property.

2.5.3 Future Land Use Changes

In the event that future land use at BNC changes, the Navy is responsible for ensuring continued operation, maintenance, and monitoring of the selected remedy; land use restrictions; excavation management; and groundwater management. NAVFAC NW shall contact and coordinate with the EPA and Washington State Department of Ecology (Ecology) to review the proposed land use changes to determine if the proposed land use adversely affects the effectiveness of the site remedy and to ensure compliance with the ROD. Changes to the regulatory-approved remedy cannot be implemented without regulatory approval. NAVFAC NW shall review and evaluate the effect the land use changes have on human health and the environment. The evaluation shall include answers to the following questions:

- Does the proposed land use change or adversely affect the selected site remedy?

- Will the need for any additional remedial actions arise as a result of the implementation of the land use change?

Changes to the regulatory-approved remedy cannot be implemented without regulatory approval. The land use control (LUC) database must be updated to reflect any land use changes.

2.5.4 Property Transfer to Non-Federal Facility

In the event that the Navy relinquishes ownership of the site (or a portion thereof), covenants and deed restrictions will ensure continued operation, maintenance, and monitoring of the selected remedy; land use restrictions; excavation management; and groundwater management. The receiving agency will be responsible for management of the LUC after property transfer. For example, if the Navy transfers OU D and the adjacent shoreline in OU B Terrestrial to the City of Bremerton, the groundwater use restrictions, land use restrictions such as prohibiting the development and use of the property for residential housing, and shoreline inspection and maintenance requirements will be incorporated into the real estate transfer documents.

During transfer of BNC property to a non-federal facility, the Navy will provide a description of the LUC, the rationale for the LUC, and description and location of the affected property. The information will be contained in a Finding of Suitability to Transfer (FOST), or equivalent document, and act as a link between the environmental and the real estate process. The FOST will document the specifications of the LUC that will need to be included in the deed and implemented through land use management and control mechanisms. Although the Navy may transfer these responsibilities to another party by contract, property transfer agreement, or through other means, the Navy will retain ultimate responsibility for remedy integrity.

Regulatory approval is required prior to any transfer, sale, or lease of any property subject to LUCs. The Navy is required to notify the EPA and Ecology at least 6 months prior to any transfer, sale, or lease of any property subject to LUCs so that they can ensure appropriate provisions are included in the conveyance documents to maintain effective LUCs. In advance of a transfer of ownership or control of the property, the Navy will take action within the limitations of their authority to ensure that the controls and restrictions identified in the remedial design will continue after the transfer, and any successive transfers pursuant to agreement among the Navy, EPA, and Ecology. If it is not possible for the Navy to notify EPA and Ecology at least 6 months prior to any transfer, sale, or lease,

then the Navy will notify EPA and Ecology as soon as possible but no later than 45 days prior to the transfer, sale, or lease of any property subject to LUCs.

2.5.5 Terminating Institutional Controls

The ICs will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unlimited use and unrestricted exposure. This IC Work Plan shall be modified to reflect any changes in ICs. NAVFAC NW shall contact the EPA and Ecology to determine if amendments to the ROD(s) are required by termination of the ICs.

2.5.6 Annual and Five Year Reports

The IC inspection reports will be forwarded to EPA and Ecology annually. Formal review of IC activities will be submitted to EPA and Ecology during the EPA-mandated 5-year review. The 5-year reviews should include sections on results from routine inspections, any monitoring conducted, development and major repairs conducted, and the status of implementation of ICs. The report submittal format will be agreed upon in advance with EPA. The reports will be maintained by NAVFAC NW.

Table 2-2. Institutional Control Inspection Checklist

Inspection Frequency/ Responsible Party	Evaluation Criteria	Inspector, Date and Time	Location of Impacted Area ^{1/}	Inspection Complete (Y/N)	Is Action Required?	Comments, Observations, Persons Notified
Every November by NAVFAC NW	Evaluate Security Trespass Report Yearly Summary provided by the Security Office for access violations or attempted access attempts. Are the Security Officers documenting the information required to evaluate exposure potential?					
Every 5 years by NAVFAC NW	Evaluate Security Trespass Report Yearly Summaries provided by the Security Office for the previous 5 years for access violations or attempted access attempts. Have access violations resulted in exposure to contaminants?					
Every November by NAVFAC NW	Perform a review of approximately 10 percent of the previous year's daily security checklists to verify that damaged signs and fencing are properly documented (location and type of damage) and are repaired within the timeframe required to eliminate exposure potential. Verify that the perimeter signs depicted on Figure 5-2 and listed below are being inspected as required to eliminate exposure potential. ^{2/}					
Semi-annually by NAVFAC NW	Perform visual observation of personnel performing an excavation. Are they following the procedures established in the Excavation Management SOP (Appendix B)?					
Semi-annually by NAVFAC NW	Perform visual inspections of personnel performing excavations to see if groundwater is being used for equipment maintenance, equipment decontamination, or human consumption. If these activities are being performed, immediately contact the appropriate environmental office.					
Semi-annually by NAVFAC NW	Ask Real Estate if there is any portion of the BNC planned for transfer to a non-federal entity within the next year? If so, have EPA and Ecology been notified?					

^{1/} List nearest building number, street name, or monitor well number.

^{2/} **BNC Access Control Signage** (see Figure 5-2 showing sign locations):

Sign Type	Sign Text
1	"US Government Property, Keep Away 300', No Photography" (4' x 6' yellow sign)
2	"Warning, Restricted Area, Keep Out, Authorized Personnel Only" (20" x 24" signs posted on chain link fence and floating boom fence, red and white), see attached photograph.
3	"Government Property, Stay 300 Feet away, Violators Prosecuted", see attached photograph.
4	"Habitat Restoration Project, Please Do Not Disturb, Thank You", see attached photograph.
5	"Government Property, No Trespassing", see attached photograph.
6	"Do Not Enter Except Buses", see attached photograph.
7	"Restricted Area Keep Out"
8	"Warning U.S. Navy Property, Authorized Personnel Only, Authorized Entry into this Restricted Area Constitutes Consent to Search of Personnel and the Property Under Their Control, Internal Security Act of 1950 Section 21:50 U.S.C. 797"
9	"Identification Checks in Progress, Have Picture Identification Ready For Inspection"
10	"Controlled Industrial Area, Green Yellow or Red Security Badge Required"

Figure 2-1. Access Control Inspection and Maintenance Decision Diagram

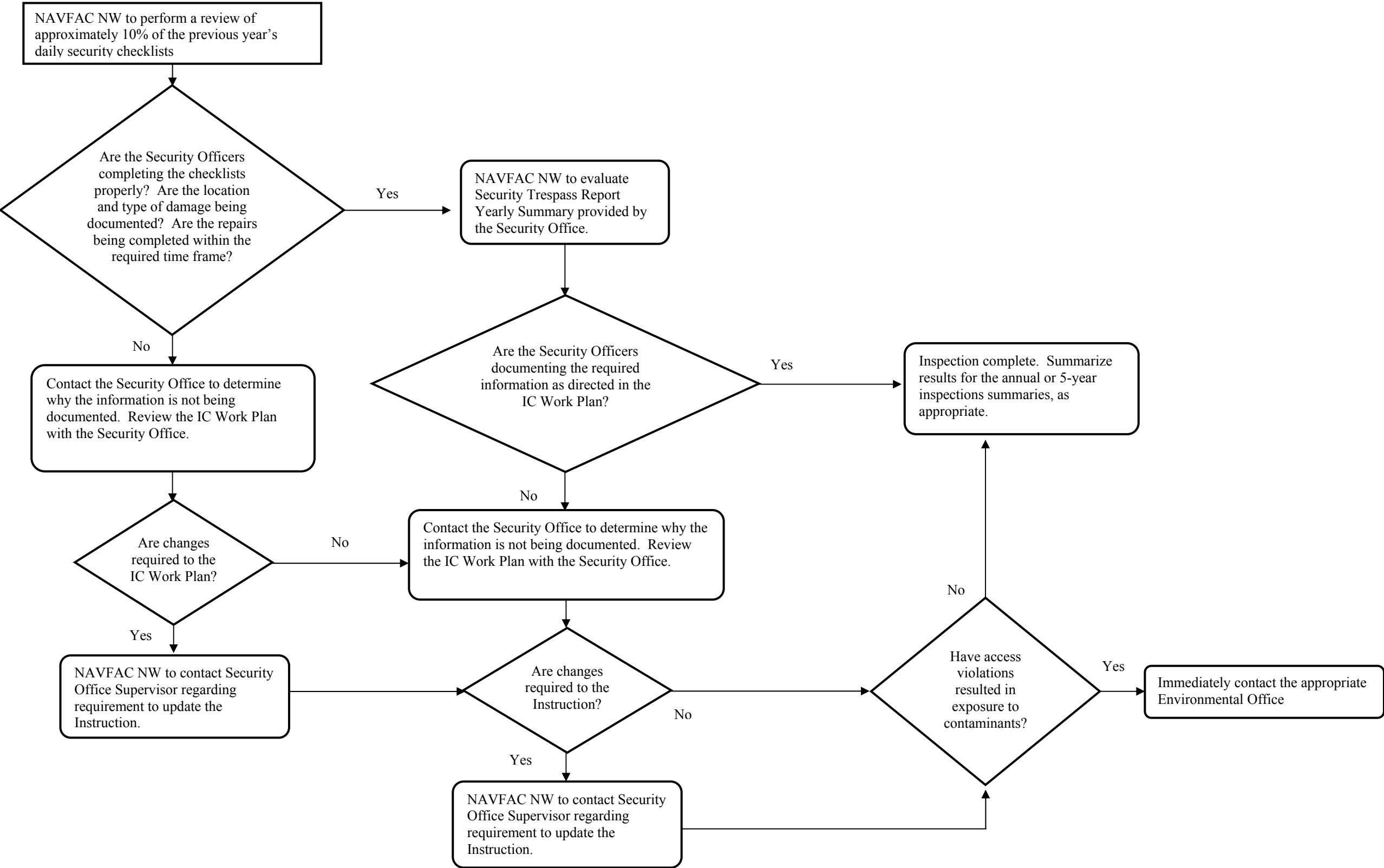


Figure 2-2. Groundwater Restrictions Inspection and Maintenance Decision Diagram

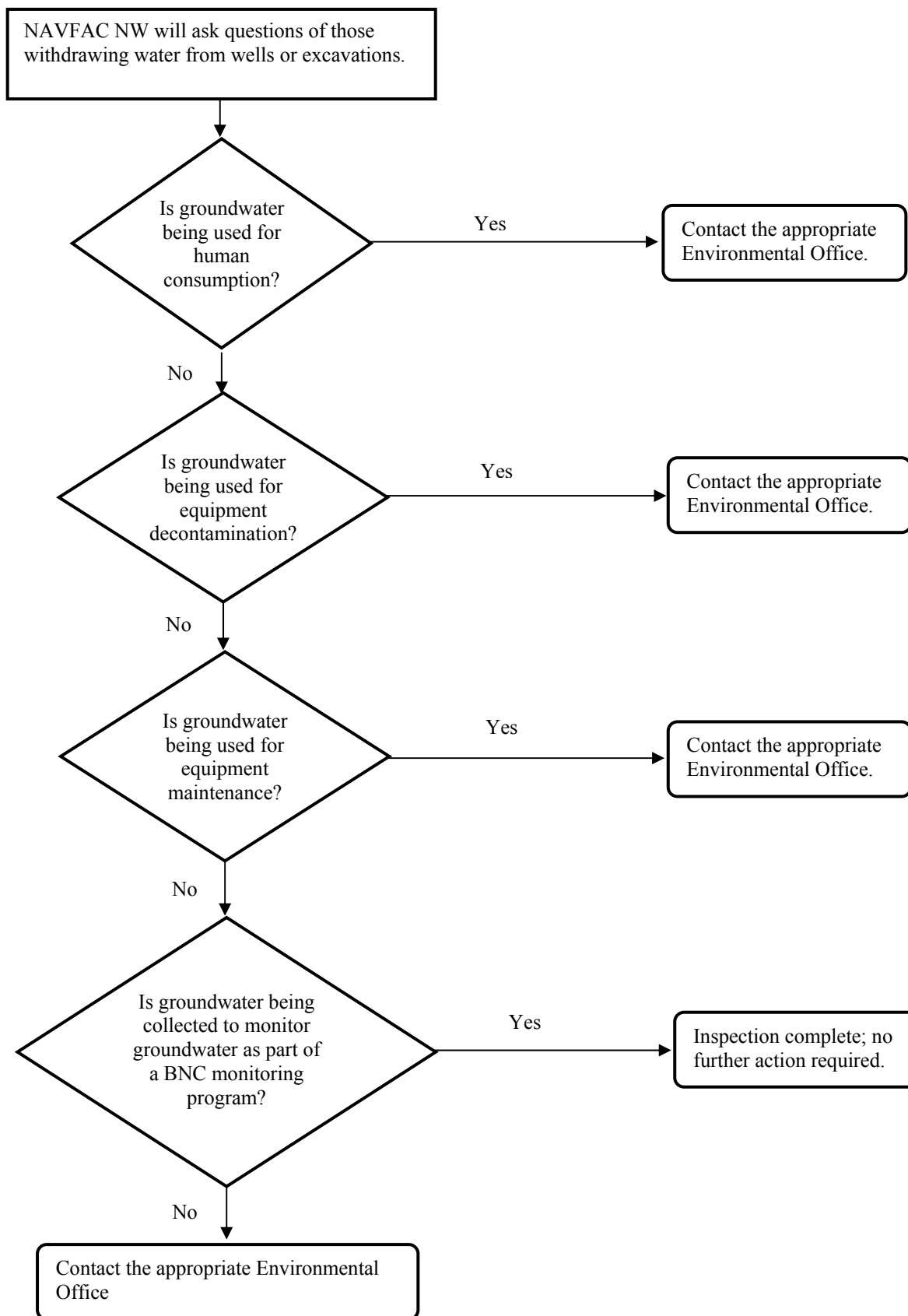


Figure 2-3. Excavation Management Inspection and Maintenance Decision Diagram

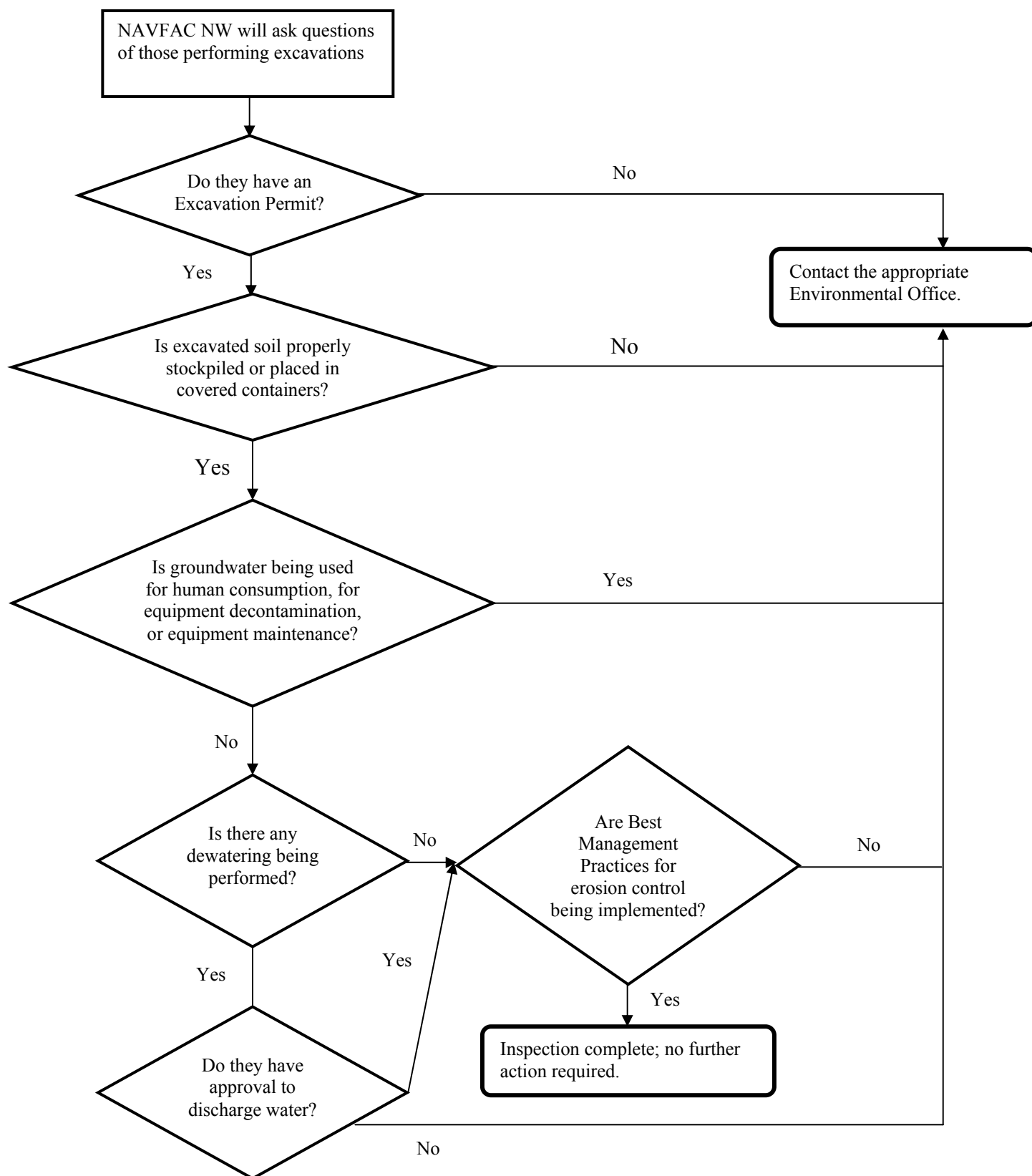
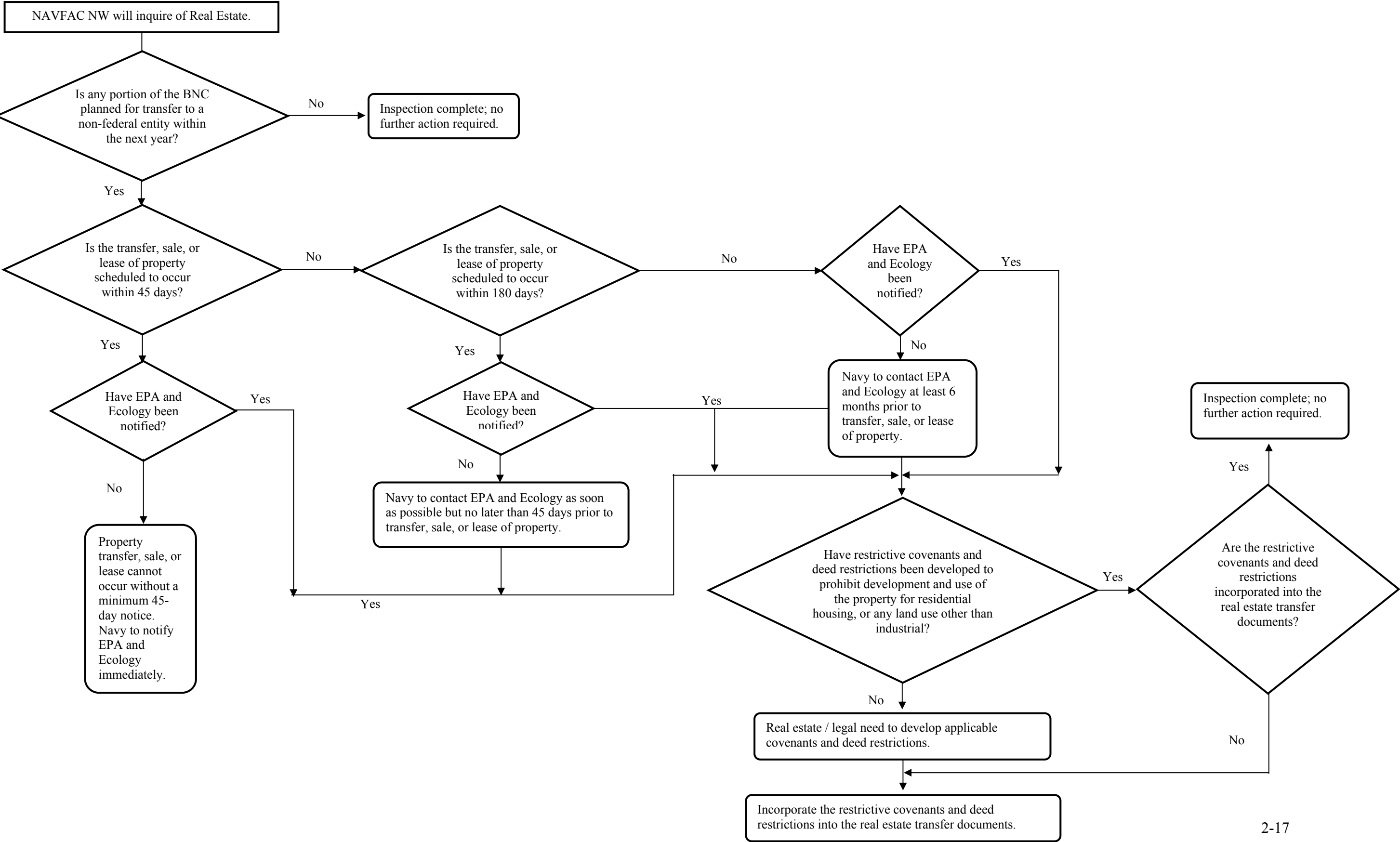


Figure 2-4. Institutional Control Inspection and Maintenance Decision Diagram



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- TtEC (Tetra Tech EC, Inc.). 2006. Final Operation and Maintenance Plan, Bremerton Naval Complex, Bremerton, Washington. RAC 3/Task Order 18. Prepared for the U.S. Navy, Contract N44255-01-D-2000. February 28, 2006.
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- U.S. Navy. 2000. Final Record of Decision, BNC OU B Marine. June 13, 2000.
- U.S. Navy. 1997. Final Record of Decision, Operable Unit A, Missouri Parking Lot and Charleston Beach, Bremerton Naval Complex, Bremerton, Washington. January 29, 1997.
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APPENDIX A
SIGN TYPES/LOCATIONS AND
CAD SITE LOCATION



TYPE 2 SIGN



TYPE 3 SIGN



TYPE 4 SIGN



TYPE 5 SIGN



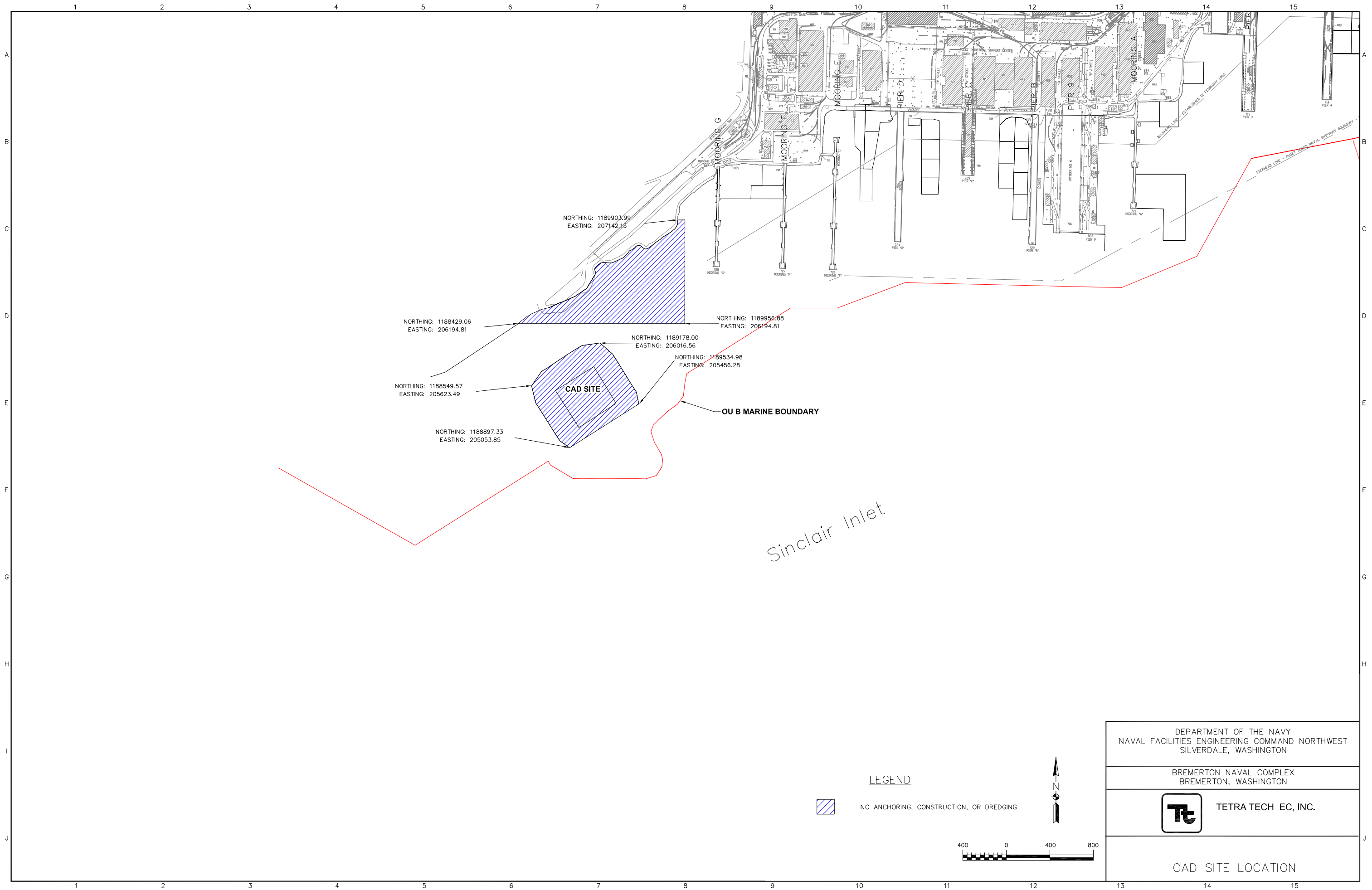
TYPE 6 SIGN



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BNC ACCESS CONTROL
SIGN EXAMPLES

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APPENDIX B

STANDARD OPERATING PROCEDURE

EXCAVATION MANAGEMENT AT BREMERTON NAVAL

COMPLEX

STANDARD OPERATING PROCEDURE

EXCAVATION MANAGEMENT AT BREMERTON NAVAL COMPLEX

Revised February 28, 2006

PURPOSE. The purpose of this Standard Operation Procedure (SOP) is to establish procedures for contractors and Bremerton naval complex (BNC) employees to protect human health and the environment when excavation is necessary during new construction or routine maintenance of facilities within the BNC. The BNC encompasses Naval Base Kitsap (NBK) at Bremerton and the Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF).

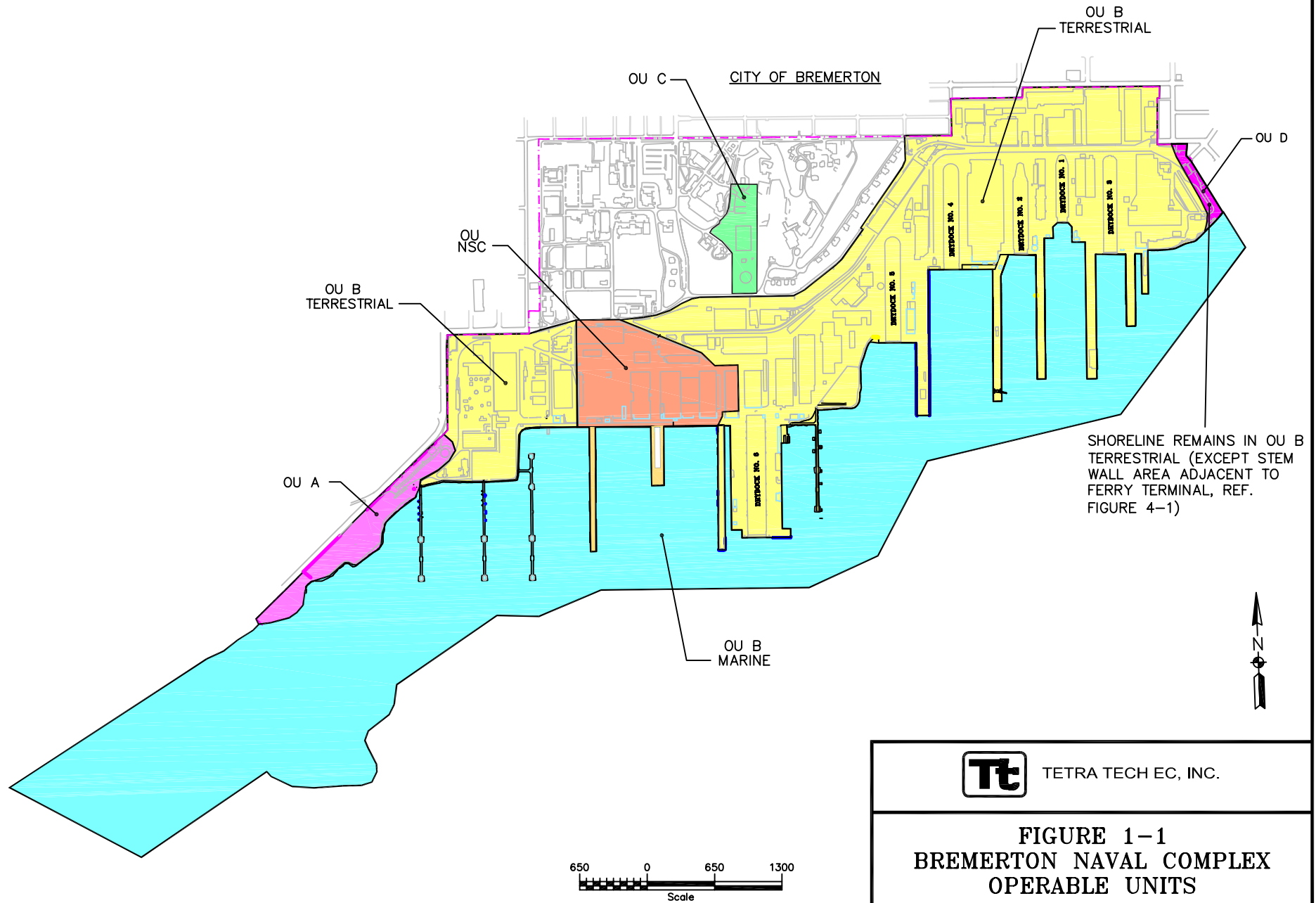
SCOPE. This SOP provides guidance for all excavation activities at the BNC and applies to all military, civil service, and contractor personnel conducting such activities.

BACKGROUND. The BNC was established over 100 years ago. Disposal practices that were considered acceptable in the past resulted in areas with contaminated soil and groundwater. The BNC was listed on the National Priorities List (NPL) by the U.S. Environmental Protection Agency (EPA) in May 1994, and is managed under the Navy's Installation Restoration (IR) Program, similar to the Superfund Clean-Up Program. Based on this listing, the BNC was divided into several Operable Units (OUs), including OU A, OU B, OU C, OU D, and OU NSC (Figure 1-1). While it is possible to uncover unexpected items during any earth-moving or excavation project, project workers need to be especially aware of this possibility when they are working in an OU.

Ongoing Navy operations at the BNC will inevitably require soil excavation in connection with new construction and maintenance of existing facilities. These excavations will breach the pavement and vegetation that cap the site, and create the potential to temporarily expose workers to contaminants, through skin contact or airborne respiratory particles. This instruction was developed to assist in controlling the human health risks and to provide procedures for the proper management (accumulation and disposal) of soil.

NATURE AND EXTENT OF CONTAMINATION. Soils from many areas within the BNC can be expected to contain some level of total petroleum hydrocarbons (TPHs), carcinogenic polycyclic aromatic hydrocarbons (cPAHs), and elevated levels of inorganics.

The TPHs of concern include all fractions (motor oil, diesel, gasoline, and total). The cPAHs of concern include benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene. The inorganics of concern include arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, silver, thallium, and zinc. Some sites also have semi-volatile organic compounds (SVOCs), pesticides, or polychlorinated biphenyls (PCBs) at concentrations of concern. The presence and



TETRA TECH EC, INC.

**FIGURE 1-1
BREMERTON NAVAL COMPLEX
OPERABLE UNITS**

concentration of contamination within each site is dependent on location and depth. Detailed information on contaminants and concentrations are available in the local libraries or in the environmental offices at the BNC.

During the planning phases of the project, the organization performing the excavation will need to review the existing soil and groundwater data. Contractors will need to work through their Contracting Officer and government employees will need to contact the appropriate Environmental Office. Review of the existing data will allow those personnel doing the excavation to assess their needs for worker protection and the possible need for additional sampling. It may be determined that available data are insufficient for making a decision on worker protection. If during the course of the project, unique or questionable conditions are uncovered (e.g., stained soil, strong odor, bones of any kind, and shell fragments), that portion of work will be stopped and the emergency response procedures followed.

PRE-EXCAVATION PROCEDURES. Before the start of any excavation, an excavation permit (see NAVSTABREMERTON INSTRUCTION 11310.10D or most recent) must be obtained. Contractors will need to work through their Contracting Officer in submitting an excavation permit request. Government employees need to work through their supervisor to contact the cognizant activity. Also, prior to excavation, the location of utilities will need to be verified as described in Instruction 11310.10D. The Naval Base Kitsap, Bremerton Site, Public Works, Code N441 maintains the drawings (including subsurface) for the BNC. They are located in Building 448. All personnel, including contractors, have access to the drawings and reproduction machines are available for use. If extensive copies are needed, funding must be provided and the job sent to Defense Printing. A person is on site to provide a brief orientation on how to locate drawings and make copies.

Other permits/outage requests may also be needed for the project (see Instruction 11310.10D).

EXCAVATION PROCEDURES. Projects involving excavation must implement the proper measures or Best Management Practices (BMPs) that will eliminate or reduce human exposure and pollutant loading from exposed soil and stormwater discharges from a site. A few examples of BMPs that are applicable to excavations are listed below. For more information regarding BMPs, consult the following publications: *PSNS's Water Pollution Prevention Plan and Control Plan (NAVSHIPYDPUGETINST P5090.30A)*; *Washington State Stormwater Management Manual for Western Washington*; and *EPA's Stormwater Management for Construction Activities, Developing Pollution Prevention Plan, and Best Management Practices, Document #832-R-92-005*.

GOOD HOUSEKEEPING. Good housekeeping prevents dirt, surplus material, solid waste, and dropped materials from being transported by runoff when it rains. Minimum BMPs for work site cleanup include weekly inspections as well as personnel and equipment decontamination.

SOIL CONTROL AND MANAGEMENT. Regardless of where soil is being excavated, the following guidance applies for reusable and non-reusable soil at the same work site, unless

otherwise approved. Contractors need to obtain approval through their Contracting Officer; government employees obtain approval through their Environmental Office.

Soil that is reusable at the same worksite should be accumulated within the same area as the excavation from which it was removed, preferably as near to the excavation as practicable. A storage area should be created in the following manner:

- Underlay the soil accumulation area with a continuous impervious sheet of plastic. Protect the plastic from perforation during loading and handling operations. The thickness of the plastic shall be sufficient to contain the soil, and in no case be less than 10 mil. Thicker or reinforced plastic, or other measures, to protect the integrity of the plastic underlayment may be required if there is danger that the plastic will be punctured or torn during soil accumulation. If it is necessary to join two or more sheets of plastic to cover the pile, all seams shall be welded, heat sealed, or taped continuously on both sides of the sheet.
- Install a berm around the pile so that soil remains in the designated area. The edges of the underlayment must be laid over the top of the berm and secured to prevent water from running under the soil pile.
- Install an impervious continuous sheet of plastic, 10-mil minimum thickness, over the pile and over the outside of the berm so that rainwater is directed away from the soil inside the berm. If it is necessary to join two or more sheets of plastic to cover the pile, all seams shall be welded, heat sealed, or taped continuously on both sides of the sheet.
- Secure the top cover sheet to ensure that wind will not balloon the cover or blow it aside leaving the soil exposed to weather.
- Keep the soil pile covered and secured at all times except when actually adding or removing soil or taking samples.

Soil may not be reusable at the same worksite due to compaction, excavation needs, or other reasons. If this is the case, the soil is considered a waste and must be handled appropriately. BNC approval is required before stockpiling soil. Contractors need to check with their Contracting Officer and BNC employees will need to check with their Environmental Office to see if it can be used somewhere else at the BNC or will need to be disposed off site.

SEDIMENT AND EROSION CONTROL. Excavation activities remove the protective ground cover at a site, resulting in the exposure of underlying soil to wind and rain. BMPs for erosion and sediment control must be established prior to excavation. Some of the BMPs for erosion control that apply to excavations are minimizing the length of time soil is exposed, installing silt fences, and protecting storm drain inlets.

MONITORING WELL PROTECTION. The integrity of monitoring wells in any excavation area must be ensured. The entity performing the excavation shall inspect the area for monitoring wells prior to initiation of excavation activities. Security of the wells such that silt or debris do not enter the monitoring wells is required. In the event that a well is

damaged or is within the footprint of the area to be excavated, Naval Facilities Engineering Command Northwest (NAVFAC NW) must be notified so that the well can be repaired, relocated, or replaced, if required.

UNEXPECTED CONTAMINATION. During excavation (or any digging or trenching operations), inspect the worksite for objects or obvious signs of unexpected contamination (e.g., cement asbestos pipe, insulation, cans, drums, stained soil, or strong odors). When obvious signs of unexpected contamination are found, immediately dial NESCOM at 911 if dialing from a BNC telephone, from a non-BNC or cellular telephone dial 360-476-2222. NESCOM should also be called if unearthing creates an immediate threat to human health or the environment. Report it as a spill to the NESCOM operator, then notify the supervisor, or if a contractor, the Contracting Officer. If there is any uncertainty, or for questionable items or signs of contamination, immediately notify the supervisor, or if a contractor, notify the Contracting Officer.

DEWATERING. Excavations may collect water either from stormwater or groundwater infiltration. Dewatering of excavations on BNC property is a complex activity because some areas are contaminated and special requirements apply. The BNC has developed procedures for dewatering at the BNC, which has been agreed upon with the Washington State Department of Ecology. The process is different depending on the location. Contractors will need to refer to the dewatering procedures and work through their Contracting Officer for further direction if dewatering is anticipated. Government employees will need to work through their supervisor to contact the cognizant activity.

STORMWATER AND WASTEWATER MANAGEMENT. During excavation activities, stormwater and wastewater must be managed to prevent or reduce water pollution. Each job site must implement appropriate BMPs to direct stormwater away from excavations. Wastewater may not be discharged into the BNC storm drains unless authorized by the BNC.

EXCAVATION SAFETY. The Site-Specific Health and Safety Plan developed for government personnel or the contractor's health and safety plan must be followed for excavation personnel safety. The plan should address, but is not limited to, shoring, benching, cave-ins, hazardous atmospheres, running water, and falling objects. A complete discussion of excavation safety is available in Section 25 of the U.S. Army Corps of Engineers *Safety and Health Requirements Manual EM 385-1-1*.

INSTITUTIONAL CONTROLS OF GROUNDWATER. Groundwater at excavation sites may not be withdrawn for human consumption, equipment maintenance, or equipment decontamination. Groundwater use is restricted to monitoring purposes only. A complete discussion of the ICs for groundwater is provided in the IC Work Plan.

SPILL RESPONSE ACTIONS. PSNS & IMF provides spill response for the BNC and has specific spill response actions, which must be initiated to provide for immediate response. This prevents hazardous substances from reaching navigable waters and ensures that proper actions are taken when a spill has occurred. The purpose of the PSNS's Oil & Hazardous

Substance (OHS) Spill Contingency Plan is to ensure that government response actions are initiated immediately to minimize adverse effects to human health and the environment resulting from emergency spill events.

POST-EXCAVATION PROCEDURES. The existing site paving, vegetation, and shoreline protection systems limit direct human contact with soil and control migration of site contaminants due to infiltration and erosion. Excavation activities cause a breach of the cap, so it is important to provide a new cap as soon as possible.

A cap is a horizontal barrier that minimizes surface water from seeping into the soil. It also prevents human exposure to the contaminants that are in the soil. A cap can be a building, or it can be asphalt, concrete, or clean soil with stabilizing vegetation. The materials and specifications for the existing pavement and vegetative caps, and shoreline protection systems are provided in Appendix D of the Operation and Maintenance Plan. The type of cap that should be implemented after excavation is complete should be decided during the planning and design phase and must ensure that the replacement caps are consistent with the Record of Decision (ROD) remedies specified for the various OUs.

Prior to placement of backfill material, an “indicator layer” delineating the start of pre-existing fill material shall be placed in the excavation. This material can be of various materials and will need to be approved by the immediate supervisor, or for contractors, the Contracting Officer.

If there are no directions for capping the site after excavation, please bring it to the attention of the supervisor, or for contractors, the Contracting Officer. In addition, if repairs other than those specified in Appendix D are desired, approval from the NAVFAC NW Environmental Department is required prior to the start of the excavation activities.

Repairs that are conducted as a result of ROD inspections will be documented in reports prepared by NAVFAC NW. The reports will summarize the work activities performed, including the materials used, specifications followed, and any quality control inspections or testing that is conducted.

WASTE DISPOSAL AND MANAGEMENT. All waste, including excavated soil, must be characterized and designated prior to leaving the BNC. Excavated soil must be managed according to BNC procedures. A complete discussion of waste identification, designation, storage and disposal is available in the most recent revision of the PSNS Hazardous Waste Management Plan (HWMP).